“Mobile Fashion” Application

Exploring design solution for the “Outfit-Centric Accessories” concept.

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ABSTRACT

This master thesis investigates studies on fashion oriented people according to the “Outfit-Centric Accessories” concept. The outfit-centric accessories concept originated from recent research study by Juhlin and Zhang (2011) about mobile phone representation in fashion and Aesthetic of Interaction area of Human-Computer Interaction (HCI). The term outfit-centric accessories originated from clothing and wearer. In this concept an outfit is playing a role as the centerpiece and a mobile phone is functioning as a sort of an accessory that can be added to an outfit. The main aim here is to explore design solution for matching the visual appearance of mobile device with different outfit of a person. The first phase of this thesis is based on a research conducted through a literature review on the Aesthetic Interaction and the Experience-Centered design approach. Literature study has been followed by studies the relation between the fashion and technology and the outfit-centric accessories concept precisely. The findings that are presented here are based on field studies on fashion oriented people who are interested in mobile phone design. Filed studies were conducted through gathering input entries from social networking services such as Facebook and Blogger, survey of questionnaire on outfit matching mechanism, and inquiring people around. The findings are described the outfit “Match Mechanism” and the “social activities around the outfit matching” in relation to the concept. These descriptions have led the project to the system design and development phase regarding the outfit-centric accessories concept. This phase resulted in the Android based mobile application named “Mobile Fashion”. This application enables a user to match a mobile device with variety of clothing in the form of a background image, cover, or printable sticker (skin phone) and it allows a user to participate in social services by sharing the look with others. It is worth mentioning that “Mobile Fashion” application presented in Vinnova-nytt (June 2011, No.3, p15) and International Joint Conference on Ambient Intelligent (AmI’11 November, 16, 2011, Amsterdam) (see appendix 14 and 15).

**Keywords:** Outfit-centric accessories, Aesthetic Interaction, Mobile design, Match application, Mobile Fashion application
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CONTENTS

ABSTRACT ............................................................................................................................ III

ACKNOWLEDGMENTS ......................................................................................................... V

CONTENTS ............................................................................................................................ VI

CHAPTER 1 PREAMBLE- INTRODUCTION-BACKGROUND-METHOD ........................................ 1

1. INTRODUCTION .............................................................................................................. 3
   1.1. Problem Statements ................................................................................................. 4
   1.2. Goal .......................................................................................................................... 5
   1.3. Research Questions ................................................................................................. 5
   1.4. Methodology ............................................................................................................ 6
       1.4.1. Literature review ............................................................................................... 6
       1.4.2. Towards design inspiration .............................................................................. 6
       1.4.3. Towards system design and development ....................................................... 7
   1.5. Contributions ............................................................................................................ 7
   1.6. Research Limitations .............................................................................................. 8
   1.7. Project Context ........................................................................................................ 8

2. BACKGROUND ................................................................................................................. 9
   2.1. Experience- Centered Design and Aesthetic Interaction ........................................... 9
       2.1.1. Aesthetic .......................................................................................................... 10
       2.1.2. Aesthetic of Interaction .................................................................................... 12
       2.1.3. Aesthetic Interaction and the outfit-centric accessories concept ......................... 13
   2.2. The role of “Fashion” in outfit-centric accessories concept ....................................... 15
       2.2.1. What is Fashion? ............................................................................................... 15
       2.2.2. Connection between Fashion and Technology ................................................ 16
       2.2.3. Fashion in relation with the outfit-centric accessories concept ........................... 20
       2.2.4. What is “centric” in outfit-centric accessories? .............................................. 21
   2.3. The outfit-centric accessories concept towards mobile phone design ....................... 21
       2.3.1. Aesthetically design in visual part of a mobile phone ...................................... 22
       2.3.2. Publicly available ............................................................................................. 23

3. METHOD .......................................................................................................................... 25
   3.1. Design methods towards aesthetic experience .......................................................... 26
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1.1.</td>
<td>Usability, Beauty, and attractiveness</td>
<td>27</td>
</tr>
<tr>
<td>3.2.</td>
<td>Practical design methodologies</td>
<td>28</td>
</tr>
<tr>
<td>3.2.1.</td>
<td>Sketching</td>
<td>28</td>
</tr>
<tr>
<td>3.2.2.</td>
<td>Low fidelity prototyping</td>
<td>29</td>
</tr>
<tr>
<td>3.2.3.</td>
<td>Design evaluation techniques</td>
<td>29</td>
</tr>
<tr>
<td>3.3.</td>
<td>Field studies</td>
<td>30</td>
</tr>
<tr>
<td>3.3.1.</td>
<td>Input entries data as methodology</td>
<td>31</td>
</tr>
<tr>
<td>3.3.2.</td>
<td>Methodology of survey</td>
<td>32</td>
</tr>
<tr>
<td>3.3.3.</td>
<td>Observe, Discuss, and Note</td>
<td>33</td>
</tr>
</tbody>
</table>

**CHAPTER 2 PHASE ONE- DESIGN PROCESS- DATA COLLECTION, FINDING AND ANALYSIS ..35**

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td>DESIGN PROCESS</td>
<td>37</td>
</tr>
<tr>
<td>4.1.</td>
<td>Exploring available fashionable mobile phone</td>
<td>38</td>
</tr>
<tr>
<td>4.2.</td>
<td>Available conceptual model for future mobile phone</td>
<td>42</td>
</tr>
<tr>
<td>4.3.</td>
<td>Design Inspiration</td>
<td>44</td>
</tr>
<tr>
<td>4.4.</td>
<td>Morvey conceptual model</td>
<td>45</td>
</tr>
<tr>
<td>4.5.</td>
<td>Design with today technology</td>
<td>47</td>
</tr>
</tbody>
</table>

**CHAPTER 3 PHASE TWO- SYSTEM-OUTFIT-CENTRIC ACCESSORIES APPLICATION DESIGN- OUTFIT-CENTRIC ACCESSORIES APPLICATION DEVELOPMENT .................................................................65**

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td>SYSTEM</td>
<td>67</td>
</tr>
<tr>
<td>6.1.</td>
<td>System Architecture</td>
<td>67</td>
</tr>
<tr>
<td>6.2.</td>
<td>Choose a System</td>
<td>68</td>
</tr>
<tr>
<td>6.2.1.</td>
<td>List of available mobile match applications</td>
<td>69</td>
</tr>
<tr>
<td>6.2.2.</td>
<td>Reflection on input options</td>
<td>70</td>
</tr>
<tr>
<td>6.2.3.</td>
<td>Reflection on output options</td>
<td>70</td>
</tr>
<tr>
<td>6.2.4.</td>
<td>Android Operating System</td>
<td>71</td>
</tr>
</tbody>
</table>

**7. OUTFIT-CENTRIC ACCESSORIES APPLICATION DESIGN ..................................................73**

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1.</td>
<td>Challenges in the Mobile User Interface Design</td>
<td>73</td>
</tr>
<tr>
<td>7.2.</td>
<td>Graphical User Interface Design</td>
<td>73</td>
</tr>
<tr>
<td>7.3.</td>
<td>“Mobile Fashion” Application Design Process</td>
<td>74</td>
</tr>
</tbody>
</table>
7.3.1. Low fidelity Prototype ................................................................. 75
7.3.2. Wireframe .................................................................. 76
7.3.3. Click Stream ................................................................. 77
7.3.4. Site Map .................................................................. 78
7.4. User Testing ................................................................. 79
7.4.1. Results from User studies .............................................. 80
7.4.2. Discussion on design techniques in evaluation ................. 80

8. OUTFIT-CENTRIC ACCESSORIES APPLICATION DEVELOPMENT ........................................ 81
8.1. Application Development process ......................................... 81
8.1.1. Interface Design and Implementation ............................... 81
8.1.2. Development procedure ................................................ 81
8.1.3. “Mobile Fashion” Application Expression .......................... 82

CHAPTER 4 GENERAL REFLECTION - DISCUSSION- CONCLUSION- FUTURE WORK ............... 85

9. DISCUSSION ........................................................................ 87
9.1. Discussion on aesthetic experience ..................................... 88
9.2. Discussion on results from field studies ............................... 88
9.2.1. Discussion on match mechanism .................................... 89
9.2.2. Social activities around the outfit matching .................... 90
9.2.3. Limitations ................................................................ 91
9.3. Answers to research questions ......................................... 91

10. CONCLUSION .................................................................... 93

11. FUTURE WORK ................................................................... 94

CHAPTER 5 BIBLIOGRAPHY ............................................................... 95

12. Bibliography ..................................................................... 97

CHAPTER 6 APPENDIX ................................................................. 101

13. SURVEY ........................................................................... 103

14. VINNOVA-NYTT ............................................................... 106

15. WORKSHOP on AESTHETIC INTELLIGENCE CONFERENCE ................................. 107
<table>
<thead>
<tr>
<th>FIGURE</th>
<th>DESCRIPTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIGURE 1</td>
<td>Hossein Chalayan Runway and Airbone Design</td>
<td>18</td>
</tr>
<tr>
<td>FIGURE 2</td>
<td>One Hundred and Eleven by Hossein Chalayan</td>
<td>19</td>
</tr>
<tr>
<td>FIGURE 3</td>
<td>The Hug Shirt</td>
<td>19</td>
</tr>
<tr>
<td>FIGURE 4</td>
<td>M-Dress</td>
<td>20</td>
</tr>
<tr>
<td>FIGURE 5</td>
<td>Victoria Beckham and Eva Longoria jointly presented the two LG mobile phones</td>
<td>24</td>
</tr>
<tr>
<td>FIGURE 6</td>
<td>Outfit-centric accessories Input and output system</td>
<td>25</td>
</tr>
<tr>
<td>FIGURE 7</td>
<td>Sony Ericsson Jalou</td>
<td>38</td>
</tr>
<tr>
<td>FIGURE 8</td>
<td>LG Prada</td>
<td>39</td>
</tr>
<tr>
<td>FIGURE 9</td>
<td>Motorola RAZR V3i Dolce &amp; Gabbana</td>
<td>39</td>
</tr>
<tr>
<td>FIGURE 10</td>
<td>Georgio Armani Samsung GalaxyS</td>
<td>39</td>
</tr>
<tr>
<td>FIGURE 11</td>
<td>Versace Unique</td>
<td>40</td>
</tr>
<tr>
<td>FIGURE 12</td>
<td>Dior Phone</td>
<td>40</td>
</tr>
<tr>
<td>FIGURE 13</td>
<td>Levi’s, Puma, and Miss Sixty Phone</td>
<td>41</td>
</tr>
<tr>
<td>FIGURE 14</td>
<td>Blog Entry from Talha Chaudhry</td>
<td>42</td>
</tr>
<tr>
<td>FIGURE 15</td>
<td>Nokia Morph</td>
<td>43</td>
</tr>
<tr>
<td>FIGURE 16</td>
<td>Samsung Bracelet Cellphone</td>
<td>43</td>
</tr>
<tr>
<td>FIGURE 17</td>
<td>Sunman Kwo design, PMP watch, and Light pool</td>
<td>43</td>
</tr>
<tr>
<td>FIGURE 18</td>
<td>Chameleion</td>
<td>44</td>
</tr>
<tr>
<td>FIGURE 19</td>
<td>Morvey</td>
<td>46</td>
</tr>
<tr>
<td>FIGURE 20</td>
<td>Category scheme from input entries in blog and Facebook</td>
<td>49</td>
</tr>
<tr>
<td>FIGURE 21</td>
<td>Survey result “How to decide what to wear?”</td>
<td>58</td>
</tr>
<tr>
<td>FIGURE 22</td>
<td>Survey result “How match your outfit?”</td>
<td>58</td>
</tr>
<tr>
<td>FIGURE 23</td>
<td>Survey result “How to communicate friend and family for outfit matching?”</td>
<td>59</td>
</tr>
<tr>
<td>FIGURE 24</td>
<td>Survey result “How match clothing and accessories?”</td>
<td>59</td>
</tr>
<tr>
<td>FIGURE 25</td>
<td>Identified input element of outfit-centric accessories concept</td>
<td>63</td>
</tr>
<tr>
<td>FIGURE 26</td>
<td>Outfit-centric accessories system architecture</td>
<td>67</td>
</tr>
<tr>
<td>FIGURE 27</td>
<td>Mobile fashion system architecture</td>
<td>72</td>
</tr>
<tr>
<td>FIGURE 28</td>
<td>Mobile fashion paper prototype</td>
<td>75</td>
</tr>
<tr>
<td>FIGURE 29</td>
<td>Mobile fashion wireframe</td>
<td>76</td>
</tr>
<tr>
<td>FIGURE 30</td>
<td>Mobile fashion click stream</td>
<td>77</td>
</tr>
<tr>
<td>FIGURE 31</td>
<td>Mobile fashion site map</td>
<td>78</td>
</tr>
<tr>
<td>FIGURE 32</td>
<td>Mobile fashion Expression</td>
<td>82</td>
</tr>
<tr>
<td>FIGURE 33</td>
<td>The final result</td>
<td>85</td>
</tr>
</tbody>
</table>
TABLES

Table 1 Example of SMS conversion on what to wear
Table 2 Clothes matching and style application in Android Market and App Store, May/March 2011
Table 3 Comments from user testing on Mobile Fashion application paper prototype
CHAPTER 1

Preamble-

Introduction-Background-Method
1. INTRODUCTION

Recently, the design of a mobile phone among HCI researchers and social scientists is becoming interesting topic, since there is a great opportunity to increase design practices from Aesthetic Interaction approach of HCI (description provided in section 2.1.3) in mobile phone design [ (Juhlin & Zhang, 2011), (Kipöz, 2003), (Katz & Sugiyama, 2005), and (Fortunati, 2003)]. In this sense, the “outfit-centric accessories” concept presented new thought for the future of a mobile design. Latest study by Juhlin and Zhang (2011) on mobile phone appearance among fashion oriented people presented this novel concept. Still the ways that technology in a mobile phone may possibly provide aesthetic characteristic in appearance for a device and the ways that design generated pleasure experience for people has been under developed.

As Juhlin and Zhang (2011) suggested, one way to increase opportunity in a mobile phone design is to follow the outfit-centric accessories concept and expand this idea in design practice. They have suggested the generation of applications that visually enable a mobile device match with what people wear, though they did not give a solutions on how to implement this concept.

The purpose of this thesis is to explore and expand the outfit-centric accessories concept in design practices. This study was explored the knowledge behind the concept, investigated study on Aesthetic of Interaction in HCI domain through literature review and a mobile phone design through available online data, and applied user studies among people who are interested in mobile phone design. In this thesis, designing for the outfit-centric accessories concept was followed by Experience-Centered Design approaches in HCI domain. From this study, different design elements around the concept are identified and used in practical design experience with using today technology that led to development of an interactive system such as a mobile application. This system is an Android based mobile application,
named “Mobile Fashion”, which allows the user to match a mobile phone with an outfit of a person in the form of a background image, cover, and printable sticker (phone skin).

It is worth mentioning, Mobile Fashion application was presented in Vinnova-nytt newspaper (June 2011, No.3, Page 15) and in International Joint Conference on Ambient Intelligent in Amsterdam (AmI’11 November, 16, 2011) (see appendix 14 and 15). However, this was the first study regarding design for the outfit-centric accessories design with today technology; we believed results from this study were used for further research and exploration between the concept and a mobile design.

1.1. Problem Statements

As referenced by Juhlin and Zhang (2011), fashion oriented people are interested in the mobile design. Therefore, the outfit-centric accessories concept has arrived from the perspective where an object treating as part of an outfit, like the ways accessory can be matched with variations of clothing. The concept aims are to treat a mobile phone like an accessory, but how do we make a mobile phone well-matched with variation of clothes and transform it as a sort of an accessory to the outfit? This is the main reason that makes designing for outfit-centric accessories challenging.

In addition, Juhlin and Zhang (2011) identified that design for the outfit-centric accessories concept required two conditions. First, the Aesthetic of Interaction should apply in the visual part of the device. Second, the visual aesthetic should apply in a way that is visible by others (Juhlin & Zhang, 2011, p. 247). Since this concept was arrived from fashion oriented people who wrote comments on visual representation of a mobile phone, designing the interactive system that can provide such changes is making the task even more demanding.

Even though, such a system might have other implications on the technological part of the mobile device such as hardware capabilities in
mobile phone. In that case, with available technology made any changes in hardware are even trickier and design opportunities are very limited. Moreover, designing a system with mentioned characteristic need to be identified by several mechanisms. Therefore, this study aims are going to be defining and describing such mechanisms.

1.2. Goal

The main purpose of this master thesis is to explore different elements in the outfit-centric accessories concept and expand it in the design practice. The goal of research is to provide results that present different mechanisms that clearly affect the understanding of how clothes and accessories match. In addition, the goal is to increase design opportunities in future applications that followed this concept. The aim is to make a system that provides beautiful, easy, and usable ways for changing the look of a mobile phone and match it with an outfit. In addition, the idea should support the concept requirements which are: 1) the Aesthetic of Interaction should apply in the visual part of the device, and 2) the visual aesthetic should apply in a way that is visible by other (Juhlin & Zhang, 2011, p. 247).

1.3. Research Questions

As I mentioned earlier Juhlin and Zhang (2011) study stated design for the outfit-centric accessories concept should follow by two main requirements. First, the aesthetic features should apply in visual part of a device. Second, design should be publicly available to others. These gave rise to following questions where this thesis aims to answer them:

- How people match their clothing and their accessories with clothing?
- How people can match their phone with their outfit?
How to find a proper way to transform the mobile phone as sort of an accessory that can match easily with outfit?

1.4. Methodology

In order to explore research questions, this study divided into three main chapters. These three chapters are presented literature review on knowledge behind the outfit-centric accessories concept and the Experience-Centered Design approach. The first phase is concerned context of design, concept inspiration, data and analysis, and result that led to the second phase of the project. The second phase is focused on the system design and development regarding this concept.

1.4.1. Literature review

The preamble section is presented researches that completed through literature reviews and studies various online blogs and entries concern a mobile design towards the outfit-centric concept. Moreover, this section is described the relation between fashion and mobile phone design. The intention in this part of thesis is understood and learnt the results of the Juhlin and Zhang (2011) study which led to the outfit-centric accessories concept. Understanding this concept is comprehended study the relation between fashion and technology as well as aesthetic and Aesthetic of Interaction in HCI through literature review. Explorations of Experience-Center Design literatures concerning design oriented practice and User Experience approach are also applied through HCI domain.

1.4.2. Towards design inspiration

The phase one of this study is presented the context of the outfit-centric accessories concept design in more detail. This phase also is
included data gathering and analysis of results that collected from user studies through a questionnaire and text entries regarding the concept. These explorations were presented an outfit “Match-Mechanism” clearly and led to the system design and development.

Design methodologies were followed by exploring experiential design practices and literature reviews toward design and Experience-Centered design in HCI. In addition, reviews of available fashionable mobile phones and futuristic conceptual mobile phone design were made. These explorations were provided design inspiration and delivered conceptual model regarding the outfit-centric accessories concept.

1.4.3. Towards system design and development

In the phase two, inspirational design led the project toward the system design and practical work with available technology. Iterative design processes were followed by applying sketching and low fidelity prototyping and evaluating the prototype iteratively. As a result, the system has introduced the first version of an interactive system regarding the outfit-centric accessories concept. This system is the Android based mobile application that enable changes in the look of a mobile phone and match with an outfit.

1.5. Contributions

This thesis presents practical design experiment from the Experience-Centered Design approach concern the outfit-centric accessories concept with using today technology. It will also present results from user studies and deliver conceptual model and actual design practices as the Android based mobile application. In addition, this study will provide interesting perspective of the concept on how individuals are involve in social activities and interested in mobile visual appearance.
Perhaps this study will bring new thoughts for future exploration of the concept in relation to the mobile phone design.

1.6. Research Limitations

Designing for the outfit-centric accessories concept is very new and still requires further practical designs and explorations. As it is such a new concept, exploring design solutions could be conducted in a variety of ways. As it is stated in Juhlin and Zhang study the main aim is to expand this concept towards future mobile phone design (Juhlin & Zhang, 2011) so data from user studies and design solution must be assessed as to how well it suits future mobile design. As this thesis is just part of the possible design explorations regarding the outfit-centric accessories concept and the studies are quite small and short term and the focus of the concept with using today technology should be cautioned.

1.7. Project Context

This project came from the recent study by researchers, Oskar Juhlin\(^1\) and Yanqing Zhang\(^2\), at Mobile Life Vinn Excellence Center\(^3\) at Stockholm University. This study investigated among fashion oriented people publicly available written online material and was pointed to the novel relation between fashion system, mobile design and Aesthetic Interaction in HCI. Juhlin and Zhang described the new concept called “outfit-centric accessories” and they aimed to develop this concept in design practice and to see how this concept can fit with future of the mobile phone design.

\(^1\) http://mobilelifecentre.org/people/show/7
\(^2\) http://mobilelifecentre.org/people/show/26
\(^3\) http://www.mobilelifecentre.org/
2. BACKGROUND

This part of the thesis specifically focuses on the knowledge behind the outfit-centric accessories concept and Experience-Centered Design approaches for concept design in HCI. The knowledge behind this thesis is divided in three major categories. The first part presents the studying on the concept in HCI domain and described the relation between the concept and Experience-Centered Design, Aesthetic, and Aesthetic of Interaction through literature reviews. Second category is described the relation between the outfit-centric accessories concept and the fashion and it also presents some actual designs in relation between fashion and technology. Furthermore, the concept requirements towards future mobile design are articulated in the last category.

2.1. Experience-Centered Design and Aesthetic Interaction

In general, Human-Computer Interaction (HCI) communities have been contributing in research and design of an interactive system for more than two decades to improve the relation between man and machine. Many disciplines, concepts, and ideas from social science, philosophy of art, cognitive science, and psychology have been gathered and adopted in this area for improving usability, efficiency, and interaction between man and technology [Juhlin & Zhang, 2011], (Overbeke, et al., 2000), (Shusterman & Tomlin, 2007), (Dalsgaard & Hansen, 2008), and (Garrett, 2011) (Dahlqvist & Norman, 2006)]. The User-Centered Design (UCD) approach among the others approaches in HCI domain is mainly focused on designing a system for a user and involving user in the design process. This approach defined by Norman (1986) and he expressed the goal of this approach to design for a user and achieve experiences that the user can easily control, interact, and
use the interactive system or artifact with satisfaction [ (Norman, 1986), (Abras, et al., 2004), (Williams, 2009), and (Norman, 1988)].

To design for experience it is important to develop the context of design for a user's needs (Garrett, 2011, p. 8). In interaction design, whole experiences that user perceive in interaction by sensory and emotional feelings as well as intellectual understanding at certain situation and environment are generally refer to user experiences (Wright, et al., 2008). User experiences are explained the usability of interactive system or artifact. So that usability of a system in this sense has been defined by the efficiency of the system, ease of use, accurate feedback, simple error handling (Norman, 1988) as well as the user's experiences, emotions, and feelings while interacting with a system or an artifact (Wright, et al., 2008). Therefore, the vital importance of human perceptions, cognitive processes, and emotional factors in HCI has been moved forward researchers to add more concentration in Experience-Centered Design approach [(Wright, et al., 2008) (Fishwick, 2006)].

As in any discipline of research, qualities involved in experienced-centered design approach are differing in this range and purpose. In this study the main constrain is aesthetic interaction and experience. As this is the case, it is more important to define the bases of aesthetic interaction and the meaning of aesthetic to design for the outfit-centric accessories concept.

**2.1.1. Aesthetic**

In view of the fact that aesthetic defined the beauty and pleasurable experiences that feel by senses (Petersen, et al., 2004) have gained valuable interest understanding user experience in HCI. This understanding required understanding philosophical thought that have been characterized the meaning of aesthetic. The word “aesthetic” is come from Greek word (Aisthitiki) that defined as perception by senses (Fishwick, 2006). Baumgarten, the German philosopher, became the first philosophical teacher on aesthetic (1750) and he
changed the meaning of the word “aesthetic” to present ”sense of beauty”, “taste”, or “ability to judge by the senses” (Hammermeister, 2002).

As several references also stressed [ (Baljko & Tenhaaf, 2008) (Shusterman & Tomlin, 2007) (Juhlin & Zhang, 2011) (McCarthy & Wright, 2004)], philosophers such as Immanuel Kant (1940) and John Dewey (2005) theorized the concept of aesthetic and philosophy of art as meaning and understanding of beauty that comes from experience that generates from our senses. Kant’s Aesthetics (Kant, 1940) defined aesthetic as something that can perceivable by the appreciable judgments that emerged by senses (Kant, 1940, p. 54). In his view, overall judgment connected with what individual are interested in thing and can defined that thing as beautiful. In addition to Kant’s aesthetic of judgment John Dewey, the American philosopher, defined the pragmatic view of aesthetic that concentrated the meaning and understanding of beauty that comes from “experience”, The sources of art in human experience will be learned by him” (Dewey, 2005, p. 5). He also mentioned to gain such experience, understanding a beauty is the key and this understanding achieve from “nature and environment” around us (Dewey, 2005).

The pragmatic view of an aesthetic by John Dewey raised the great interest among HCI researchers [ (Juhlin & Zhang, 2011) (McCarthy & Wright, 2004) (Petersen, et al., 2004)]. Therefore, combination of art and technology or “practice of art to the field of computing” (Fishwick, 2006, p. 6) has been created new approach in Computer Science and HCI named “Aesthetic of Interaction”, “Aesthetic Interaction”, or “Aesthetic Computing”. This approach is pointed to experiences that emerged from sensation, socio-cultural, and environmental aspects that created pleasurable, agreeable fleeing, and understanding. These experiences are defined as the “aesthetic experience” [ (Dewey, 2005), (Shusterman & Tomlin, 2007), (Juhlin & Zhang, 2011) and (Dalsgaard & Hansen, 2008)]. In other word, aesthetic in this domain has been defined from by beauty and pleasurable experiences that perceived by senses in interaction with the system [ (Juhlin & Zhang, 2011) (McCarthy & Wright, 2004) (Petersen, et al., 2004)]. As this study also followed pragmatic view in the sense of aesthetic, following section continued on
aesthetic interaction in system design and aesthetic experience particularly.

2.1.2. Aesthetic of Interaction

Broadly speaking, “Aesthetic of Interaction” has expressed the beauty in interactive systems or artifact based on human’s experiences and perception of beauty that could be perceived in interaction with the system, for instance by sense of touch or visual sense [ (Petersen, et al., 2004), (Overbeeke, et al., 2000), (Baljko & Tenhaaf, 2008), (Shusterman & Tomlin, 2007), (Dalsgaard & Hansen, 2008), and (Djajadiningrat, et al., 2007)]. So that aesthetic here has characterized with different qualities such as beauty and harmony in appearance or in the ways of interaction. This means that aesthetic has two different views: one view focuses on aesthetic of interaction with artifact or system while the other focuses on the aesthetic features in the visual appearance of artifact or system. In both Computer Science and HCI aesthetic has very similar implication, but HCI researchers are shows a greater interest that indicated as aesthetic experiences.

Computer Science area signified aesthetic in two different applications (Fishwick, 2006): One is “analysis” that focused on the qualities of applications such as beauty aspect of the interactive artifact or system while other is “synthesis” that represented aesthetic in interaction with artifact or system. In this sense, synthesis applications are concentrated bodily and physical involvement for performing interaction, for instance in relation to mobile phone, touching a mobile phone interface by fingers in order to interact with it. While, analytical applications are essentially met the virtue of loveliness and attractiveness of artifact or system.

Aesthetic implication in HCI domain distinguished by analytical and pragmatic view [ (Wright, et al., 2008) (Petersen, et al., 2004) (Shusterman & Tomlin, 2007)]. Following Shusterman (2007), analytical view of aesthetic explains the virtue of beauty and loveliness in appearance, while pragmatic view of aesthetic indicates the special
kind of experiences that emerges in interaction. Drawing on Petersen, Iversen, and Krogh (2004) findings, distinctions between analytical applications and pragmatic views are defined in experiences and expressions:

"From the analytical HCI perspective, there is a natural focus on experience, while the interaction design perspective, on the other hand, naturally has a primary focus on expression; we study someone using computational things or we build computational things to be used by someone.” (Petersen, et al., 2004, p. 271)

This distinction also captured by Juhlin and Zhang (2011, p. 241) that explained it is not only about appearance but also the usability of a system. In this relation, Petersen, Iversen, and Krogh study by drawing on Dewey’s pragmatic view is mentioned about the capability of aesthetic in design of an interactive system and named it as “pragmatic aesthetic”. In this view, Petersen pointed out (Petersen, et al., 2004), the importance of socio-cultural as well as to mind and body involvement, experiences, and Juhlin and Zhang (2011) pointed out the importance of “environment” where the interaction happens as an important aspects of aesthetic experiences. As this is the case, the outfit-centric accessories concept design should generate aesthetic experience emerge in interaction with visual appearance of mobile. Therefore, system for the outfit-centric accessories should design by a beauty features and interaction should provide efficiency and usability (Norman, 2004).

### 2.1.3. Aesthetic Interaction and the outfit-centric accessories concept

As mentioned earlier, the discussion on the importance of aesthetic of human-computer interaction has been created many debates among researchers in HCI domain. In general, aesthetic interaction in Experience-Centered Design approach expressed enjoyable, agreeable, playful, and appealing experiences that emerged in interaction with the system or artifact[ (Norman, 1988) ( Wright, et al., 2008) (Petersen, et al., 2004)]. As a matter of fact, the role of “aesthetic interaction” has
been considered very important position in different branches of HCI and interaction design. In relation to the Mobile-HCI area, recent study (Juhlin & Zhang, 2011) has been expanded new link between aesthetic interaction, fashion system, and mobile-HCI. In this relation, Juhlin and Zhang (2011) introduced the outfit-centric accessories concept that focuses on aesthetic interaction from visual appearance of a mobile phone. Therefore, for designing system and understanding mentioned relation it is more important to define the design approach for the concept and the relation of aesthetic interaction in HCI domain through literature review.

To design system regarding the outfit-centric accessories concept, understanding how a user is percept aesthetic features and how to design aesthetic features plays very significant role in this thesis. So for this Understanding HCI researcher has been developed various frameworks according to John Dewey pragmatic view. Drawing on Wright, Wallace, and McCarthy (2008) framework, understanding aesthetic experience in interaction has been identified by three themes: “a holistic approach continues engagement and sense making, and rational or dialogical approach” (Wright, et al., 2008, p. 4). The holistic approach is for understating experiences that emerges as linkage of intellectual, sensual and emotional feeling. Continuous engagement and sense-making refers to the historical experiences and future anticipation (Wright, et al., 2008, p. 4) that person bring with self and make meaning of an experience and relational or dialogical approach indicates the fact person share the experience through channel of communication, “since the experience of it is always completed in dialog with those other centers of value” (Wright, et al., 2008, p. 4).

In addition, Dalsgaard and Hansen (2008) studies suggested system design based on user perception by engaging a user in three interactive actions with a system. These three actions are: “Act of interacting” for understanding the system by interacts with the system, “Act of perceiving” where a user identifies and perceives the system, and “Act of performing” where a user act and perform. For design we developed design practice for understanding aesthetic experiences (Wright, et al., 2008) trough simple act of interaction that enable a user to perceiving system and performed an appropriate action in order to perceive the system functionality (Dalsgaard & Hansen, 2008). In addition,

### 2.2. The role of “Fashion” in outfit-centric accessories concept

In order to see the relation between the fashion and the outfit-centric accessories concept, in this section we had described the term of the “fashion” in this context and the role of fashion in the outfit-centric accessories concept.

#### 2.2.1. What is Fashion?

Usually the word “fashion” brings the image of the latest mode, novel, and unique design in clothing to our minds. Describing the word “fashion” is very complex: because many cultural, philosophical, and social elements are influence the meaning of fashion (Fortunati, 2003). Coco Chanel, famous fashion designer defined fashion as:

>“Fashion is not something that exists in dresses only. Fashion is in the sky, in the street; fashion has to do with ideas, the way we live, what is happening”

As a matter of fact, the word “fashion” has been defined various meaning (Carnegy, 2006), such as clothing, garb, garment, current style, manner, shape, adornment, decoration, and type. The fashion definition has been changed time to time in history, as Kawamura (2005) also referenced, “the meaning relies on the period of time that term “fashion” is used”.

In this study we mainly put the attention to meaning of “fashion” as in function with clothing. If we took closer attention to the meaning of
fashion in clothing, clothes not only indicted individuals’ expressions such as style, type, and taste also presented an economical aspects, social, physical, and cultural background of a person (Seymour, 2008). These presentations in society have created a communicative system that shared various specifications of individuals. According to Fortunati (2003), fashion is something that presents the personality, identify a person in sociality, it presents the “social body” that share information such as, gender, personality, class, and activity as well as economical perspective. If we look through fashion hundred years ago, “in classical theory fashion appeared to represent differences in level of wealth within society”, Vinken (2005) said. In this perspective, Vinken added in that time women spoke for a wealth of his husband by variety of clothing and jewelry and shared this information in society, since in that time usually husband supports his family economically. As also pointed in several references[ (Carnegy, 2006), (Vinken, 2005), and (Kipöz, 2003)], fashion creates the system that not only creates economical approach but also supported variations in fashion trends, rapidly changes in clothing and style, and makes individual to be recognizable within society.

Lately, fashion has been penetrated the world of technology, though the ways improve the relation with mobile phone technology is very new and has been under developed (Juhlin & Zhang, 2011). Following section provided some examples regarding the relation of fashion and technology.

**2.2.2. Connection between Fashion and Technology**

Recently, the relation between fashion and technology has presented an interesting path both in fashion industry and technology. Recent studies showed fashion industries considering the technological growth as powerful connection (Kipöz, 2003) to their progress and technological industries such as mobile industries also seeing the fashion influences into their advancement [ (Juhlin & Zhang, 2011) (Fortunati, 2003)]. Moreover, several studies pointed out the relation and modernism influences of fashion especially in mobile phone design
(Juhlin & Zhang, 2011), people taste and social values (Fortunati, 2003), and mobile industry’s market (Kipöz, 2003).

Earlier, we pointed out that aesthetic experience is all about a beauty, experiences, and feeling that perceive by different senses. We also added in HCI domain perception of beauty and uniqueness in everyday objects generates positive emotional meaning that also gives a user good feeling and encourage creativity and innovation (Norman, 2004), so that attractive things works better. Therefore, design is one the most significant part of providing great experiences and it is designer task to generate such an experiences. Concerning this relationship, for instance, today mobile industries such as LG work directly with the fashion famous designer PRADA, and introduced LG PRADA mobile phone. Fashion designer, Hussain Chalayan, also used technological material, such as led, in his fashion collection and introduced new fashion in clothing to audience. Seymour, who is innovator and trends supporter on next generation of “wearable” things, defined the relation between fashion and technology as:

“Technology and fashion are not as distant from each other as it might first seem. The thread-up and thread-down of the weaving process corresponds to the 0 and 1 binary logic of computer circuitry.” (Seymour, 2008, p. 15)

As a result, combination of fashion and technology has generated new ideas in both fashion and technology. Seymour referred to this phenomenon, intersection of design, fashion, science, and technology (Seymour, 2008, p. 12), as a “fashionable technology”.

On the other hand, in HCI and Computer Science domain, “wearable” technology and “ubiquitous” computing areas have delivered interesting paths especially in the mobile phone design and development. Mark Weiser (1993) introduced “ubiquitous computing” notion. Ubiquitous means existing everywhere, when it comes to technology it means having a computer and technology in everyday activities and object around. Long ago, it was very hard to imagine that there will be a time when people could be able to communicate with each other, everywhere at any time, but now a mobile phone or smart
phone with virtue mobility makes that dream become true. “Wearable computing” or “wearable technology” referred to the wearable computer devices that can be wearable and it is accessible and controllable by a user [ (Seymour, 2008), (Wallace, 2007)]. Example of wearable technology we can refer to the Wallace digital Jewelry (2007) that presented wearable digital jewelry that emotionally represents user feeling.

In fashion, technology appeared in different kind. As mentioned earlier, in clothing fashion there are many designers who recently working on new clothing styles that attached with digital materials. Designers, such as Chalayan (Seymour, 2008)(Figures 1, 2) used several digital materials like LED light technology into his fashion collection.

![Figure 1](image1.png)

![Figure 2](image2.png)

Figure 1: Picture 1, runway show by Hossein Chalayan fashion show Spring/ Summer 2008 with Swarowski collaboration, London, UK
Ying Gao (Seymour, 2008) is another designer that applied different sensors, such as pressure and sounds sensors, in her collection. These dresses reacted and made changes in appearance by touching and breathing sounds. Moreover, several emotional clothes that can refer here are: Hug Shirt (Figure 3) hug over distance by using Bluetooth technology), Irene (blouse and pants that can verify schedule and information on the move), SkateHoodie (jacket that allows listen to the music without carrying iPod), PhotoPhore (light on the swimsuit for swimming at night), and M-Dress (Figure 4: Mobile phone dress that attached with standard SIM card and allows phone call without any mobile phone) (Seymour, 2008).
2.2.3. Fashion in relation with the outfit-centric accessories concept

In order to define a meaning of the term “outfit-centric accessories” specifically, here we began with describing different subjects that helped to understand the meaning of the concept. Juhlin and Zhang studies (2011) used the terms “outfit” and “accessories” in order to express the relation of this concept with fashion. In this concept, Juhlin and Zhang defined fashion as “link to change and complex and modern society”…”the link between the self and world, as expressed with clothes, is always ambiguous” (Juhlin & Zhang, 2011, p. 243).

The term “outfit” in this concept refers to clothing and visual representation of the entire look. An outfit presents individual expressions, such as style, type, and taste, but also presents an economical aspects, political, social, physical and cultural background [Carnegy, 2006], (Vinken, 2005), (Seymour, 2008), and (Kipöz, 2003)]. In fashion, “accessory” refers to the objects that worn or used for fashionable effect to outfit. It is often various items that added to the clothing, such as, bag, shoes, jewelry, hat, and belt. Accessory in fashion divided in two groups; one group is the accessories that are wearable like shoes, hat, tie, glove, and jewelry and the other group is the one that can carry like bag, cans, and umbrella. In the outfit-
centric accessories concept, Juhlin and Zhang used the meaning of “outfit” and the function of “accessories” from fashion as in function of the clothing. In this concept, a mobile phone device carries as form of accessory with an outfit of a person.

2.2.4. What is “centric” in outfit-centric accessories?

The “centric” expression in this concept originates from the role of accessory in both fashion and mobile industries. In the mobile phone industries, a mobile phone is the center of attention and accessory are things or objects that can add to the device and provide more functionality. Juhlin and Zhang (2011) called this concept as “device-centric accessories”. While in fashion, accessory is a thing or object that can add to clothing, therefore, outfit is centerpiece. Juhlin and Zhang named this impression as “outfit-centric accessories” concept. From this mismatch between fashion and mobile industries, authors concluded that “the co-existence of these perspective might lead to the conclusion that mobile phone have already been appropriate as fashion accessories” (Juhlin & Zhang, 2011, p. 247).

2.3. The outfit-centric accessories concept towards mobile phone design

Invention of mobile phone has been considered as marvelous and revolutionary development in our social life. Each year, several mobile phones with various design and technology introduce to the public and distribute in market. Since the first day the mobile phone arrived, the look and the system functionality has changed enormously. Mobile devices become smaller, lighter, more attractive, more interactive, and more complex, therefore, the design become even more challenging (Das, 2010, p. 540).

As mentioned before, various studies has shown that the attractiveness of the mobile phone device plays significant role in user
satisfaction [ (Juhlin & Zhang, 2011), (Kipöz, 2003), and (Fortunati, 2003)]. Fortunati (2003) presents the relation between mobile phone design and fashion as way individuals represents themselves in social and share information about themselves with others. On the other hand, Juhlin and Zhang (2011) study among online blogs reported the ways fashion celebrities are interested and talked about mobile phone design and appearance like the ways they express their feeling with clothing. Moreover, authors (Juhlin & Zhang, 2011) also noted some blog entries that fashion gatekeeper and celebrities considered the mobile phone as an integral part of an outfit i.e. like an object that you can add to the outfit.

Here, one of the important and mutual notions that Juhlin and Zhang (2011) identified between the fashion and the mobile phone design is the term of “accessory”. As mentioned in previous section, Juhlin and Zhang (Juhlin & Zhang, 2011) explained the concept of “accessory” from both fashion and mobile phone point of view. Accessory in fashion is something that can add to an outfit, such as bag, shoes, jewelry. Accessory in mobile phone indicate to objects that can add to the device such as headset, device hanger, or decorative case, cover, or shell. Obviously, accessory in both fashion and mobile design is notable concept, though with a different meaning. Therefore, from this relation between outfit and mobile phone Juhlin and Zhang suggested application that matches visual part of the device with outfit of person (Juhlin & Zhang, 2011, p. 247). Juhlin and Zhang (2011) believed that there is great opportunity in the future of the mobile design by following the outfit-centric accessories concept. Based on this idea, authors defined two important requirements regarding this concept: 1) Focus of aesthetic interaction from visual and appearance perspective. 2) Design should be publicly display to the public (2011, p. 247). In the following section mentioned requirements will discuss in more detail.

2.3.1. Aesthetically design in visual part of a mobile phone

Earlier on this thesis, we stated aesthetically design of interactive system is into account for many years. Recently, aesthetic approach is
expanding more and more in mobile industries, (Kipöz, 2003) from both aesthetic in interaction (like a user experience and feeling while interact with the main screen of the mobile phone by touching, feeling and seeing) and aesthetic in appearance views, i.e. visual look and physical characteristic of the device (Juhlin & Zhang, 2011).

Thinking through the mobile phone design from a visual perspective, mobile industries believed the influence of fashion and beautiful design as one of the main key to their success [ (Juhlin & Zhang, 2011), (Kipöz, 2003), (Fortunati, 2003)]. Therefore, mobile industries consider design, material and modernism factors as serious challengeable task in to their design. Study by Juhlin and Zhang pointed out, “nowadays mobile and fashion industries are seeing each other as a great motivator for growth and they are engaging to create a new connection” (2011, p. 242). Moreover, they stated this link as a “unique” relation between the fashion system and mobile HCI. Obviously, the outfit-centric accessories concept aims to develop aesthetical and beautiful characteristics in visual part of the mobile phone that match with variety of clothing; therefore, the ways aesthetic design may possibly apply for this concept has been considered challenging.

2.3.2. Publicly available

In fashion, publicly availability is one the way to present design and beauty to others, share information, and present individual point of view with others [ (Fortunati, 2003), (Juhlin & Zhang, 2011)]. Publicly availability of mobile phone refers to the social practices that involved in sharing information such as device features, color, size, weight, material, case, and device itself with others in specific environment. Juhlin and Zhang (2011) study shows that fashionable people are cares about the attractiveness and unique design which is visually available to the others and more appealing to their taste. This is all about experiences and information that people percepts and perceives in environment while looking at the device that presented publicly [ (Juhlin & Zhang, 2011), (Fortunati, 2003)].
Previously, we mentioned the outfit-centric accessories concept aims to buildup aesthetic experience and beautification in the outlook of the mobile phone that match with an outfit of a person. As Juhlin and Zhang (2011) also stressed, physical and bodily interaction has been involved in performing fashionable behavior to the public. Physical or bodily interaction specified as sociable act by fashionable people and celebrities, for example, in a way presents mobile devices available to public while holding it in hand and showing device to others. These acts of expression presents the social point of views (Kipöz, 2003) that is believes and values that people puts to makes the mobile phone sociable (Fortunati, 2003). In this sense, figure below is an example that shown famous celebrities, Victoria Beckham and Eva Longoria, presents LG mobile device.

Figure 5

Figure 5:

“Victoria Beckham” and “Eva Longoria” jointly presented the two LG mobile phones: “LG Lotus Elite” and “LG Rumor Touch”.
http://www.cellphonedigest.net/news/2010/04/victoria_beckham_and_eva_longoria_ad_campaign/
3. METHOD

In Previous chapter, we studied the relation between the outfit-centric accessories concept, aesthetic of interaction approaches in HCI domain, and fashion. Based on mentioned relationship, this study has been followed research methodology that led to user experiences from aesthetic of interaction point of view. Therefore, we applied design from Experience-Centered Design approaches among the other approached in HCI communities. More details have provided in the section 3.1.

In order to design for the outfit-centric accessories concept, we had developed visual representation of the concept (Figure 6). For design and development of a system concerning this concept, it is necessary to recognize design elements such as system input and output. Input here referred to the various elements that the system needed to combined them for outfit matching, i.e. those elements that individuals used for match clothes and accessories together.

![Figure 6: Outfit-centric accessories concept: input and output](image)

Figure 6
Output elements referred to matched between a mobile phone and an outfit (Figure 6). After outfit matching elements were identified, we used those elements in design practice by applying useful sketching and prototyping design methodologies. Moreover, design evaluation was done by user testing of the prototype. Design methodology sections 3.2 of this chapter will present these methods particularly.

Based on the finding on literature reviews, research followed by requirements gathering regarding the outfit-centric accessories concept. For collecting input data, we were applied user studies method among fashion oriented people who are interested in mobile design. User studies were applied through survey of questionnaire and collection of input entries through Blogger and Facebook that will describe in the section 3.3 explicitly.

3.1. Design methods towards aesthetic experience

As stated before, one of the main requirements of the outfit-centric accessories concept is to apply aesthetic interaction in the visual part of the device that is available to others. The main point here is to increase attractiveness of the device and design for beauty as well as usability. Designing for aesthetic experiences has been appeared as useful design method in interaction design [ (Juhlin & Zhang, 2011) (Wright, et al., 2008) (Petersen, et al., 2004)]. This method has been followed Experience-Centered Design approach within HCI domain.

As we stated in previous chapter, since HCI researchers shows a great interest in Dewey’s pragmatic view of aesthetic that described in “Art as Experience” (Dewey, 2005) and developed frameworks [ (McCarthy & Wright, 2004) (Wright, et al., 2008) (Dalsgaard & Hansen, 2008) ] for understanding aesthetic experiences, therefore, we have focused on developing prototype of a system for the outfit-centric accessories concept aesthetic experiences that emerged as appealing “sensual” and “emotional” feeling regards the “look and feel” as well as usability of the system in interaction. Worth mentioning, there is distinction between “sensual” and “emotional” experiences in this sense. As
McCarthy and Wright (2004) distinguished it, sensual thread considered the experiences that body and sensory feeling experienced it in a situation or interaction, for example, the look and feel of the artifact. While emotional thread reflected on the judgment of our needs and desires, for example our feeling of joy, anger, fear, or satisfaction. Since fashion oriented people care about the visual representation of a mobile device (Juhlin & Zhang, 2011), we concluded in addition to usability, beauty and attractiveness are the vital features in design. Beauty and attractiveness features in look of the mobile phone device increases aesthetic experiences that emerged from visual representation, which is the main requirement of the outfit-centric accessories concept.

3.1.1. Usability, Beauty, and attractiveness

There is no doubt that beauty is the main attribute for presenting attractiveness and goodness in art work and design. In interaction design, beauty in design and interaction is the task that completed through designer's thought (Wallace, 2007). Designer is the one who is responsible to create experiences that define feasibility and usability of the system and present system interaction, functionality [ (Norman, 2004) (Norman, 1988)], and appearance as aesthetically appealing for user [ (Overbeeke, et al., 2000), (Shusterman & Tomlin, 2007), (Wallace, 2007)]. Beauty here refers to pleasing and impressive quality if design in functional, interactional, and pleasing visual appearance. Drawing on Overbeeke, Djajadiningrat, Hummels, and Wensveen (2000) studies, beauty in usability of the system or artifact has been considered as necessity feature of design, therefore, “Visual attractiveness is not only about beauty on the surface, but also influences efficient interaction and usability” (Juhlin & Zhang, 2011, p. 241).

Moreover, beauty is the part of the aesthetic experience and aesthetic experience is the goal of designer (Overbeeke, et al., 2000). The discussion in previous chapter explained usability and efficiency creates the beauty and pleasant experiences. To design for the outfit-centric accessories concept, we have considered beauty, attractiveness, and beauty in ease-of-use as our crucial elements of design. At this stage, we had continued design by identifying input elements of the concept. Recognizing the input elements of design were followed by
user studies between fashion interest users who care about mobile design that latter on in this chapter presented (section 3.3).

3.2. Practical design methodologies

Practical design for a new concept is demanding, since design plays a significant role to delivering relation between a system and a user. Without design exchange of thought and finding suitable and usable solution is very hard to achieve. In addition, design is what makes the user testing and evaluation possible (Fallman, 2003). In this study, we followed sketching and low fidelity prototyping practices in design phase. Interaction and interface design in this study followed “Eight Golden Roles of interface design” that defined by Shneiderman [ (Galitz, 2002), (Dahlqvist & Norman, 2006), (Wood, 1997), and (Johnson, 2010)], more details provided in development process of application (chapter 3, section 7).

3.2.1. Sketching

Design applied through sketching design methodology for outfit-centric accessories system design. This technique is very beneficial at the early stage of the design process, since sketch creates vision and exchange though simply at the beginning. Additionally, from Design-Oriented HCI perspective sketching is one the useful way to create conversation based on design between researcher, designer, and developer [ (Fallman, 2003), (Tohidi, et al., 2006)]. Sketching applied in the different parts of the design process. At the beginning we used this technique to shared idea and presented concept model for the future of the mobile design. Later on the design process, we applied sketching in application design and user evaluation.
3.2.2. Low fidelity prototyping

Development concerning new concept is challenging. Therefore, creating prototype and mockup is very useful at the early stage of the design and evaluation. Prototyping has been provided basic vision of the system and give designers fast feedback at early stage of design. Through prototyping, it is much easier to share though and explore various solutions concern design and usability [(Houde & Hill, 1997), (Rettig, 1994)].

We chose low-fidelity (Lo-Fi) prototyping (paper prototype) technique, for application design and testing users since *prototype allows to demonstrate the behavior of the interface very early and test design with real user* (Rettig, 1994, p. 22) and it *is extremely fast to develop and easy to learn and use* (Rettig, 1994, p. 22).

In addition, several advantages for Lo-Fi prototyping that can refer here are; it is very simple, fast, cheap (just need pen and paper), and easy to make any changes in the design process. Mentioned advantages are increasing efficiency in design process and users testing. Acknowledging Houde and Hill (1997) study and Retting (1994), by paper prototyping making any changes and testing is very fast and allows interaction and user experience designer to share and exchange more designs and ideas. In iterative design process we prepared and designed various paper prototyping regarding the outfit-centric accessories design, and then we evaluated design until reached the proper design solution.

3.2.3. Design evaluation techniques

Evaluation includes various techniques that test system interaction and functionality from user’s perspective. Usually for improving design and system functionality, these techniques have been applied at the beginning and all the other phases of the design process. By system evaluation at the early stage of design, applying any changes in interaction and system functionality is much easier and faster. It is
also important evaluates a system again and again during iterative design process and gets user’s feedback faster till reaches better design (Norman, 1986).

Regarding the outfit-centric accessories system evaluation, we recognized “Quick and Dirty” evaluation methodology very useful among other methods, such as, expert testing and heuristic evaluation. Since the project was quiet small and short term, “Quick and dirty” evaluation techniques compare to other techniques provided us with very fast input process and usable technique (Abras, et al., 2004) that facilitate the user's evaluation and suits the needs of project’s time and cost as well as feasibility of the application (Norman, 1986). This method allowed us observes user's action, simply take a note, and ask participant’s to “think a loud” and shares their feeling and experiences regarding “look and feel” as well as “usability” of the system. With this method, we made changes simply by using pen and paper in paper prototype after getting feedback. In this way, system evaluation and changes had applied from user’s feedback in a very short time.

3.3. Field studies

Concerning the outfit-centric accessories concept, finding the right material is a challenge per se. Therefore, to reach answers to research questions and finding design elements (input elements) we investigated requirements gathering and studies on individuals who are fashion oriented and care about the mobile design. Methodologies that we decided to follow in the project conducted through field study and gathering input entries from users, applying survey of questionnaire, and have informal talk with people around (those who made match between their device and clothing). Details of these methodologies presented in section below.

Through field studies we collected data concerning how individuals matching clothes and accessories together and how they decide what to wear and create the look for themselves. These materials collected during January and March 2011 and presented in details in the section
5. All collected materials analyzed through Content Qualitative Analysis method. Qualitative content analysis method applied for analyzing data material that gathered from open-ended questions and written comments, individual interviews, logs and journals, case studies, and other kind of written material [ (Juhlin & Zhang, 2011), (Powell & Renner, 2003), and (Neuendorf, 2002)].

3.3.1. Input entries data as methodology

The field studies had begun by preparing “Mobile and Fashion4” blog at Blogger, and Facebook community page named “Fashion and Mobile Phone5”. Juhlin and Zhang (2011) study referred to the influence and the role of fashion blogger in relation between fashion and mobile phone;

“Both online magazines and online blogging are part of large arenas of social activity, where fashion interaction has extended into new forms of communication and new topics. Online fashion writings, therefore provides means to study the link between the fashion world and that of mobile phone use.” (Juhlin & Zhang, 2011, p. 243)

Therefore, in this study we gained advantage of this relation and created the “Mobile and Fashion” blog at Blogger. Further, we also realized to using social network, such as Facebook, will be very beneficial for finding right materials regarding outfit matching. So that we decided to create Facebook community page, invite people, elaborate project, and ask members directly “How they match their clothing?”

The “Mobile and Fashion” blog presented the outfit-centric accessories concept and followed by description and the goal of the project. This blog designed in a way that user easily replied to the questions in the command box. This feature allowed individual to share their though with us by responding to three questions in command box. We

4 http://mfashion-mobilelife.blogspot.com/
5 http://www.facebook.com/pages/Fashion-and-Mobile-phone/186563141360500
gathered six comments regarding first research question in this blog. Questions we left in blog are presented below:

1) *How you decide what to wear?*
2) *How you match your outfit, for example, how match your tie or sock with you outfit?*
3) *What is your style i.e. how you describe yourself with your outfit?*

56 replies collected from the members of the “Fashion and Mobile Phone” community page in Facebook. In Facebook, we prepared page with information regarding “MFashion” project at Mobile Life Vinn Excellence Center. In discussion tab of this page, we prepared two questions regards outfit matching and individual’s style. We collect 23 replies concerning clothes and accessories matching and 33 replies regarding individual’s representation by their style. Details regarding analysis and results from input entries were presented in the analysis section in the next chapter (chapter 2, section 5).

### 3.3.2. Methodology of survey

Survey (Appendix 13) had been organized by ten questions and spread through Facebook and KTH (Royal Institute of Technology) students email list, Mobile Life Centre mailing list, and Fashion students at Stockholm University. The survey message introduced the survey and the relation between fashion and mobile design. The main intention of the survey questions was inquired individuals share with us how they decide what to wear and match clothing and accessories together. Therefore, questions were designed in a way that participants responded about clothes matching and explained for us social activities that occurring while they decide on matching and wearing. By social activities here we refer to activities such as getting help from someone else thought, choice, and judgment concerning match between clothes and accessories. Someone else could be family members, friend, partner, or husband/wife, someone very close to a person, or it could be someone like a fashion icon, specific fashion designer’s design, and so on.
185 respondents collected from survey questionnaire that particular analysis through quantitative research methodology and presented in the next chapter (chapter 2, section 5). Since this methodology has been representing the empirical data in form of numbering and statistical form, it is very common to use it for understanding the relations in large amount data [(Gilchrist & Weber, 1972), (Gilchrist & Weber, 1972)]. Quantitative method applied through FreeOnlineSurvey website. FreeOnlineSurvey presented number of individuals responds for each question in statistical graph. Details and description were provided in the analysis section in next chapter (chapter 2, section 5).

3.3.3. Observe, Discuss, and Note

During the research process, we have decided to talk with individuals around, colleague, friends, and family members in case they interested in the mobile design or matched their mobile phone with their outfit. So we have observed individuals, communicated with them, and asked them how they apply matching. While having conversation with them, all explanations had been noted and analyzed through qualitative content analysis methodology.
CHAPTER 2

Phase one-
Design process- Data collection, finding and analysis
4. DESIGN PROCESS

Stated in the various literatures, aesthetic of interaction is referred to characteristics such as beauty in usability and visual part of a system/artifact and aesthetic experience is referred to pleasurable experiences that emerged in interaction. In design phase, we applied usable and beautiful features according to requirements of the outfit-centric accessories concept. Mentioned earlier that these requirements are: 1) aesthetic features should apply in the visual part of the device and 2) appearance of device should present the aesthetic features in design in a way that noticeable and observable by the public. Considering mentioned perspectives helped us identified possible options for output elements in design. These options are included visual part of the device, such as interface, side and back of the device, also several accessories that can change visual part of a device, like case or cover, phone skin.

Design processes were divided in three parts: the first part presented several explorations that had been done through available fashionable mobile designs and available futuristic conceptual mobile phone. The main intention here was for applying relevant design model for the outfit-centric accessories concept. Moreover, we wanted to present new idea and new design. Also design should share the knowledge of aesthetic interaction and presents the combination of input material produce output of the project in appealing way.

Our inspiration, vision and conceptual model presented by sketching concerning the outfit-centric accessories concept. This conceptual model named Morvey that latter on this chapter presented clearly (section 4.3). Further on the system design and development chapter (chapter 3), we applied essential features of Morvey model into practical work by using available technology.
4.1. Exploring available fashionable mobile phone

In this section, we referenced to mobile designs that emerged from combination of elegant design ideas, technically feasible, and beautiful materials that also economically viable. Design for the outfit-centric accessories concept needed fashionable point of view so we found that very interesting to see the ways designers make device fashionable. Therefore, we referred to very well-known fashion designers, such as Versace, Dolce and Gabbana, and Dior that collaborated with mobile industries and designed their own brand mobile phone. In this section, we listed some of these mobile phones.

Sony Ericsson Jalou design inspired by highly fashionable design factors that fashion designer such as Dolce and Gabbana collaborated with Sony Ericsson and present their design and name in Jalou by Dolce and Gabbana version (figure 7).

LG Prada (KE850) is another example that considered as vastly fashionable mobile phone. LG Prada is again, results from
collaboration between LG mobile and the world one of the most famous fashion designer, Prada. In addition to design’s view of LG Prada, this device also designed by high technology of today’s smart phone. It has touch screen, camera and other features that included latest smart phone. Similarly, Motorola and Dolce and Gabbana, Samsung and Giorgio Armani they were designed stylish mobile phone collaboratively. (Figures 8, 9, and 10)

Figure 8: “LG PRADA” (http://www.lg.com/se/mobiltelefoner/mobiltelefoner/LG-KF900.jsp)

Figure 9: Motorola Razr V3i Dolce & Gabbana

Figure 10: Giorgio Armani Samsung galaxyS (http://www.armani.com/samsung/en/index.html)

Meanwhile, various famous fashion industries such as Dior, Versace, Miss Sixty, Puma, and Levi’s announced their own mobile phone. Versace in collaboration with ModeLabs Group announced the Versace Unique mobile phone. This mobile phone considers as one the chic, luxury and most expensive mobile phone that exists today that also
featured by high technology and designed by jewel and gold materials (see figure 11). Likewise, the latest Dior phone designed by white gold, diamonds, and pearl that also pushed the concept of accessory more into the mobile design (see figure 12).

Figure 11: “Versace Unique” (http://mobile.versace.com/)

Figure 12: “Dior” (http://www.diorcouture.com/dior-phone.html)
It is worth to add, some of these design produced a new mobile phone with expensive materials in order to create strong business in addition to unique design and experiences. Study by Katz and Sugiyama (2005) also pointed to the strong influences of modernism idea, fashionable style, and chic features in a mobile design that delivered strong marketing promotion in mobile phone industries. However, uniqueness and attractiveness of a mobile phone is very important to success within these industries, but people satisfaction is also very important. Even though people in many blogs and magazines wrote their opinions and they questioned why they should pay vast amount of money just for attractive mobile phone, since it is just a “phone”. The quote below is an entry from “Hardware insight” website about redesigning Nokia phone to luxury phone:

"Elegance has become the desire of every person, but everyone cannot afford it. People with unique choices are always admired. Some people want to define their
wealth in term of their cell phone choice; this is where the elegant and fashionable designs come. There is no doubt that these unique designs comes up with a huge price tag on them. But to set your choice apart from millions, this price is reasonable. (Talha Chaudhry, July 5, 2010)

Figure 14: entry from Talha Chaudhry

“World’s famous designers and jewelers have rendered their skills in integrating the remarkable gemstones with Nokia cell phones and have come up with something that is the true definition of elegant. These cell phones are redesigned for a niche market, which certainly comprises a very little portion of total cell phone market. The design of these cell phones speaks for their prices.”

(http://www.hardwareinsight.com/6-most-expensive-nokia-cellphone-redesigns/)

4.2. Available conceptual model for future mobile phone

Here, we gathered several conceptual designs regarding future mobile phone designs that are available in various websites. Mainly designers presented ideas based on how to make a mobile phone wearable and more usable in some way. Interestingly, some ideas already presented futuristic concept of wearable phone as “bracelet phone” and “watch phone” (Figure 15, 16, and 17).
Figure 15: Picture 1 “Nokia Morph” Concept (http://www.youtube.com/watch?v=Aw2yiOhsFsc)

Figure 16: Picture 2 “Samsung Bracelet Cellphone”, Erik Campbell designed a very original Samsung bracelet phone (http://www.thedesignjournal.org)

Figure 17: Picture 3 is The designer Sunman Kwo developed a new conceptual portable device which will do your palm more functional (http://www.dagadgets.com)

Picture4 “PMP Watch” concept designed by two companies, True Inc. and Propeller Inc (http://www.dapreview.net)

Picture 5 is “Light Pool” mobile phone that was created by Hironao Tsuboi with the intention of service you an object that can act aesthetically upon your sensibility and surroundings. This futuristic mobile phone has a unique form, composed of a truss-like structure and surfaces. (http://www.tuvie.com/light-pool-mobile-phone-by-hironao-tsuboi/)
4.3. Design Inspiration

The main idea in this study is inspired from chameleon’s skin functionality (figure 18). Chameleon changes skin color for social signaling, communication and protection. The idea inspired by the fact that chameleon skin able to match with the surface in a short distance, not the changes that appeared due to chemical activities and emotional senses. By this fact, imagine changes in the look of the mobile device just by putting a device and an outfit close together and results device and outfit matching. Visualized device transformation could apply by changes in color, pattern, or even shape of the device (like wearable accessories). Therefore, the main idea suggested capable materials, especially hardware materials, that enable device automatically transform visual changes in skin phone, detect pattern and color, and transform the look match with variety of clothing. Perhaps, changeable and adoptable hardware and digital materials can increase changes in the future the mobile phone design.
4.4. Morvey conceptual model

Morvey conceptual model introduced a new wearable type of mobile phone that functioning like clothes accessories. This design applied through sketching and presented device as a different sort of accessory, such as “broach”, “belt”, and “necklace”. The idea followed the outfit-centric accessories concept that display aesthetic characteristic in design and visual appearance that publicly is available to others.

The idea inspired by chameleon’s skin changeability that also suggest new sort of smart materials that can automatically adopt pattern, shapes, and color, and match with variety of clothing. Also this concept designed in a way that suggested a user how to match outfit with mobile phone.

Morvey model is designed by combination of three convex shape layers interfaces (see figure 19). Two of these layers are settled in ways that enable resizable interface for different purposes, for example, for typing or plying game. Picture 1 and 2 shows mentioned features precisely. In picture 1, upper interface display game screen and lower interface is the game handles that simply open by pressing on downside keys of the device. Picture 2, shows interface that open by the upside keys for typing.

Further, picture 3 and 4 presented the mobile and outfit matching. As it is presented in sketch, part of the shirt pattern matched with the device and changed the whole look of the device. For matching functionality, we suggested pattern recognition system that automatically detect match pattern according to the distance between device and clothes. Moreover, this picture shows how this device can function like clothes accessories to an outfit.
Figure 19:

“Morvey” designed by author of this thesis. Morvey is the new conceptual models for future wearable mobile phone (Belt, Necklace, and Broach). The idea is to make mobile phone changeable and adoptable to user outfit. Picture 1&2 shows device interface with game handle and the keypad. Picture 3 & 4 shows the outfit matching on visual part of the mobile phone.
4.5. Design with today technology

Changeable and adoptable virtue that defined in Morvey conceptual model served to reinforce great interest in future mobile design. As a limitation of this research continuation of idea has been followed with today technology. Therefore, instead of working on the conceptual practices, study followed identifying current system and selecting input and output elements for the outfit-centric accessories concept. Further on this study (chapter 8), we will discuss concern input and output elements in more details.
5. DATA COLLECTION, FINDING AND ANALYSIS

In this section, we have gathered all data from user studies and presented analysis of data and results from analysis with details. These data collected during January and March 2011. As we also mentioned in several parts of this study, the main intention is to find input elements for the outfit-centric accessories design practice. Since in this concept device function as outfit accessory, we realized clothes and accessories matching process in this relation can provide us with clear vision on “How to design for device and outfit matching”. Therefore, we have started our research by understanding individual point of view on outfit and clothes matching. Since fashion oriented people shown a great interest in mobile design, our target user groups identified through individuals who are interested in fashion and care about the mobile phone design.

5.1. Input entries data collection

“Mobile phone and Fashion” blog in Blogger and “Fashion and Mobile phone” community page in Facebook were identified as our options for gathering input entries from users. In both Blogger and Facebook, we described the concept and questioned members how they match their clothing and accessories together.

Data collected from 23 replies in Facebook and seven comments in Mobile phone and Fashion blog. We analyzed and developed seven categories through qualitative content analysis. Data resulted in the category scheme graph (see figure 20) based on the most elements the people considered concern outfit matching.
5.1.1. Input entries finding and analysis

In picture below (figure 20), we provided category scheme from individuals point of view concern question “How you match your outfit?” from blog and Facebook community page. The number in the graph presented the total replies according to category; therefore, numbers here not indicated the number of entries.

Each color in graph (figure 20) represented different groups of data. We called these groups “elements of system design”. These groups are: 1) Putting things together, 2) Personal style, 3) Clothes and accessories look

Figure 20: Category scheme from input entries in Facebook and Blog regard outfit matching
look, 4) Color harmony, 5) Occasion and place, 6) Mood and feeling, and 7) Fallowed fashion. In the following, we will discuss these groups with examples.

(1) Putting thing together

Some entries indicate that they match outfit by visualizing and putting things together where that can see the match. Entries below revealed the ways participants make outfit matching. For example, in entry below user indicated outfit matching by putting things together in the “head” or “next to each other”:

“... I put things next to each other and decide whether they go together (oh... depending on availability of time, I can also put things together in my head!). It is a matter of paying attention to detail and having taste!”

Other entry in this sense pointed to “thinking” about how to match and “mixing” clothes based on the look and create match:

“...I will think about each one and mix the appropriate colors2gether to have a good harmony...”

Furthermore, in entries below one pointed to several elements, such as, “combination” of clothes, “thinking” about new clothes, “pictured” the look, “searching” through closet, and “try on outfit” for outfit matching:

“...If I have an early morning (work) I usually decide on what to wear the day before. And then it is a combination of clothes that fits the office space. ... I think the "longing for new clothes" is very interesting...”

“...every morning I have a picture of what I want to wear and how I want to feel that day. ... I try to remember what I have in my closet and often I have a couple of options to choose from. ... I like to go through my closet some times to see what
is hidden/old and see how I can incorporate that into my existing outfits. And I think it is important to try the clothes on to see what I feel like in this outfit, because feeling good and comfortable is a very important factor when it comes to what to wear.”

(2) Personal Style

In some entries, participants pointed to their own unique look and style for outfit matching. Comments referred to styles or type of outfit, such as simple, classic, casual, fashionable, or in some cases following other people style. In this sense, “style” plays the main role for clothes matching. Following entries presented outfit matching by personal style:

- “...though my own style. If the trends is parallel with my style that would of course best case”
- “..., I prefer simple styles with a very dedicate fabric and a good cut...”
- “...each location needs its own fashion style and cloths. For example, I prefer to wear casual when I'm invited for a lunch to a friend's house or I may wear suits if I want to attend a wedding...”
- “I look for color and style but in detail and also from different person view”

“Fashionable according to my student’s style. I look at them and choose something that I also like.”

“I prefer Jean with Black or White all the time, classic...isn't it!”

“every types of outfit-formal,sport,etc,- has its own characteristics in matching...”

“The most important thing is harmony, harmony in style(formal/sport), color(not more than 2 or 3 colors at a time) and fabric(thin/ thick).

(3) Clothes and accessories look

Concerning clothes and accessories matching, comments signified match elements between “clothing and specific piece of the accessories” together and some other considered “color” as important element for
clothing and accessories matching. Following entries provided some examples from blog and Facebook community page:

“I love to match my dresses & shoes with each other. I wear clothes with the same harmony of colors.”

“I always match my tie with my shirt and my trousers with my socks and belt”

“I usually match socks to my blouses. On the other hand, when I wear jeans and boots as I said before I still try to match socks with my blouse, which is nonsense because it will not be seen, but for some reason I still have the urge to do it. :D

“. I usually match my shoes with my dresses”

“Then with regard to the dress/coat I have chosen and also depending on the occasion I will choose accessories: shoes, bag, jewelry and even cosmetics (mostly nail polish and lipstick). I might go for a matching color or an opposite color.”

“another thing that is important for me it’s the gender and color of my shoes and hand bag, they should be the same..

“ I match my sock with my pants, my shoes with my bells, and my tie with the mixture of my shirt and suit colors. It all depends on colors.”

(4) Color harmony

Clothes and accessories matching based on the “color harmony” and “color spectrum” pointed quite a lot in entries from Facebook and blogger. Participant indicated directly the importance of color and color matching in outfit matching. Here we provided some examples from text entries concerning importance of color in clothes and accessories matching:

“...after I try to match colours, I guess I have a feeling of what I think goes and doesn’t and I try to match after what colours work or not.”

“...If I have only one color on my clothes (black) I like to spice it up with like red, green or striped socks.”
“I like to wear all the color in the same time :D but I usually match my coat and shoes together. but most of the time I wear one spectrum of color...”

“compatibility is what I think of usually, it’s more like using 2 or 3 colors at most...”

“sometimes I match them with the same color and s.t not....for me it's important 2 have a good harmony in all...I will think about each one and mix the appropriate colors2gether to have a good harmony.”

“I remember some years ago I had the habit of wearing clothes, skirts, shoes, socks and ..... all of the same color scheme. But now I'd prefer wearing OPPOSITE COLORS. ;)”

“match another things with them, harmony is most important,, but sometimes it’s interesting that u wear the opposite colors, I think it wants a lot of self-confidence”

“knowing colors and using the best brands ...”

“Generally, I prefer darker colors but I cannot live without wearing white”

“ I usually wear black. Other colours might be eye catching but black is very chick... the most important thing is harmony, harmony in style(formal/sport), color(not more than 2 or 3 colours at a time) and fabric(thin/ thick).

“I look for color and style but in detail and also from different person view”

“Harmony of colors is so important for me, I usually match my shoes with my dresses...I love to wear colorful dresses but I don`t like to wear opposite colors at the same time...”

“I wear clothes with the same harmony of colors.”

(5) Occasion and place

Many entries refer to elements such as occasion and place for clothes matching. From this point of view, participants explained the importance wearing right outfit in the right place. Moreover, they also
provided some examples in this sense. For example, they pointed directly how they match clothing for to the specific occasion and specific place. Here, we provided some samples from input entries:

“Maybe I have to be more properly dressed for an important meeting or maybe I’m meeting some friends out and not doing anything that would make me think that there are any boundaries to what I could wear. So it all comes down to what boundaries there are in what is okay to wear, what situation and which people I meet that day”

“It depends. If I have an early morning (work) I usually decide on what to wear the day before. And then it is a combination of clothes that fits the office space.”

“I might consider the location that I want to go like university, work, party, wedding, family gathering, invited for a dinner and so on. So, each one of these locations need its own fashion style and cloths.”

“In depends on my mood and where I want to go, for example if I wanna go to uni or supermarket I never think but if I want to out like party, pup.”

“Depends on the occasion”

“Then with regard to the dress/coat I have chosen and also depending on the occasion I will choose accessories”

(6) Mood and feeling

From participant’s personal perspective on what to wear and how match clothing, we realized the “mood” and” feeling” of a person at the exact moment of decision making on “what to wear” has a great influence for create the look. Entries reflected on “comfortable virtue of clothing”, “feeling”, and “mood” for representing effects of their personal’s emotions and feelings in outfit matching. See the following examples from entries:

“...And I think it is important to try the clothes on to see what I feel like in this outfit, because feeling good and comfortable is a very important factor when it
comes to what to wear. I can look like amazing or horrible but it doesn’t matter if I don’t feel comfortable.”

“When I am off it is more dependent on my mood: what makes me happy, or what gives me a nice feeling”

“In depends on my mood and where I want to go, for example if I wanna go to uni or supermarket I never think but if I want to out like party, pup,”

“depends on my mood”

“Just based on how I feel. How I feel determines color and how aggressive or dressed up I will look. Tired might result in just baggy stuff.”

(7) Followed fashion

Some entries pointed to the influence of fashion, fashion icon, and fashionable style in clothes and accessories matching. In entries participants referred to the “fashion blog”, “inspiration from others look”, and “trend”. Juhlin and Zhang study (2011) on fashion and mobile phone design also referred to the fashion bloggers role as “gatekeeper” in this area:

“…fashion blogs have recently become integrated into the diffusion part of the system, and blog-ers are acquiring the role of gatekeepers.” (Juhlin & Zhang, 2011, p. 243)

Here, some examples from input entries concern fashion role in clothes and accessories matching were presented:

“I read fashion blogs or blogs with interesting pictures to get inspiration from them. I can also get inspired by what people wear on the streets…”

“…base on trends, though my own style, If the trends is parallel with my style that would of course best case in point…”

“knowing colors and using the best brands…”
“Fashionable according to my students style. I look at them and choose something that I also like.”

5.1.2. Discussion of the input entries

130 members and large amount of responses in “Fashion and Mobile phone” Facebook community page and comments in “Mobile phone and Fashion” blog have shown a great interest of participants concern the mobile design and the outfit-centric accessories concept. Participant by giving examples of their personal life and explaining outfit matching process explicitly, showed their desire, attention, and consideration in this area.

Regarding the outfit-centric accessories concept and the mentioned categories above (1- Putting things together, 2- Personal style, 3- Clothes and accessories look, 4- Color harmony, 5- Occasion and place, 6- Mood and feeling, and 7- Fallowed fashion), we found that very interesting the ways participants put thing together (first group) in order to create the look. Among other groups from this category, we recognized it is the matter of people taste, feeling, emotion, and situation at the moment that influences in outfit matching.

We concluded answers to research question regarding an outfit matching described clearly in the ways individual putting things together by considering influential aspects. Therefore, one important input elements of system design comprehended in a way that a user can visually see the match and able to put clothing and accessories together. Moreover, other influential element of design signified by individuals’ taste, emotion and feeling, and their situation for creating the look. Therefore, we decided to provide function in the system that a user able to edit, control, and customize the look based on his/her feeling, taste, and situation.
5.2. Survey data collection

Participants of survey questionnaire (Appendix 13) provided us with 185 responses. These responses gathered from 56.32% male and 43.68% female mostly between 18-32 years old (88.07%). These data had been analyzed through quantitative and qualitative content analysis methods. Due to large amount of data for each question we provided static graph through FreeOnlineSurvey and analyzed findings through quantitative analysis method. Qualitative content analysis method applied to the comments from questions number 4, 7, 9, and 10. These static diagrams represented individual's responds in total. In the following, we will discuss in more details on findings and analysis.

5.2.1. Survey analysis and finding

In survey, for each questions we provided four to six answer as options and provided comment box in case participants needed to add something. We selected answer options from same as the input entries categories. Since we realized various elements influenced individuals’ decision on outfit matching, we designed prioritizing option for answers in order to recognized and distinguished influential elements clearly.

Concerning “How you decide what to wear?” question (question No.3), figure 22 was presented graph representation of the overall responses. Collected responses were mainly prioritized by referring to “Occasion and place”, Mood and feeling”, and “Color matching” elements. Moreover, results from “How you match your outfit?” (See figure 23) were essentially shown that “Personal style”, “Following fashion”, and “Mood and feeling” elements have the most priority. Comments from this question concerned individual “Unique style” and the importance of “Place and occasion” in outfit matching.
It is appeared that 85% of responses were indicated social activities have greater influence in outfit matching. For example, participants declared they discuss with friends, partner, or family members in order to decide what to wear and how to make the look (questions No.5, 6, 7). In survey questionnaire, we also asked them to explain for us and give an example of services that they use for communication in this sense. Besides face-to-face communication we also provided the list of services such as, mobile texting services (SMS/MMS), sending email, video call, and sharing photo in answer options. As it is presented in graph below participant declared between all the options above “sending text
message”, “video call” and “sending email” has the highest priority and usage.

Figure 23:
Responses according to question 6: “In what way they discuss with friends and family”.

In the right side picture, X scale define the priority rating and Y scale shows the people responds.

According to results priorities of elements are: **sending SMS/MMS, video call, sending email, sharing photo** and at last **face-to-face communication**.

Regarding “clothes and accessories matching” question (question No.9) participants stated elements such as, “color harmony”, accessories “material”, and the “function” of accessories with clothing has an important role in matching (figure 25). Moreover, results from comments entries in this question also added matching between accessories with part of the “clothing” and “Place and occasion” also very important in clothes and accessories matching.

Figure 24:
Responses according to the question on “how match outfit with accessories”. Results show that priorities are options A, B, and E. **Y scale**: responds, and X scale shows:

A) Depends on color
B) Depends on material (gold/ silver)
C) Depends on what is fashionable
D) Depends on fashion designer (Gucci, Channel, Armani)
E) I don’t use accessories
F) Other F indicated inputs that people send directly according to that.
5.2.2. Discussion of the survey

The vast amount responses (185) to survey questionnaire had been shown even more interest in the outfit-centric accessories concept and future mobile design. In addition to various elements that were identified from input entries, survey findings were pointed to the importance of “social activities” that involve in outfit matching. By social activities here we referred to activities that involve between a person with other person such as asking other opinion for outfit matching, sharing thoughts for the matching, and discussing about the visual look.

Evidently, we found that social activities in this sense are very interesting. Social interaction around outfit matching is not new, but the ways people interested to improve these social activities around mobile phone visual appearance is very interesting. Therefore, we recognized social activities are crucial elements in a system design concern the outfit-centric accessories concept. Therefore, we decided to deliver social services in the outfit-centric accessories system functionality that helps a user to be able to share the visual look of her device and exchange opinion with others.

5.3. Written notes from observation and conversation

Since the idea of this study increase our accuracy on appearance of people devices, we decided to take advantage of this opportunity and talk with people about visual appearance of their device. In order to find proper case, we started by observing people in KTH university and Mobile Life center and asking our friends and family members. We gathered information from two persons in the Mobile Life center, two students at KTH University and three persons from our friends and relatives.

From the Mobile Life center, one person matched color of the shirt with mobile phone cover. Other person, applied changes in device appearance by phone sticker and change phone skin. In this sense,
these individuals declared they are very interested to make their mobile phone something more specific and attached to them. They also pointed that they wanted to make device unique that represents the person in some way.

From conversation with two students at KTH, friends and relatives, we also realized they are very interested to use cover and sticker (skin phone) in order to make their mobile phone more personal, fashionable, and into the attention. They also pointed to some advantages of sticker that it is changeable easily and it is cheaper compare to the cover. Moreover, participant added cover is very important for their device, because they usually used it for safety and for identifying their device.

Since survey study had been shown that individuals interested in asking other opinion and sharing the look with friends and family, we became eager to found out “How individuals use text messaging for sharing visual look”. Therefore, we asked from some of our friends and relatives regarding exchange look by texting. Interestingly, they replied usually they share with persons who are especially close to them or with one they do shopping. In the text, they usually starts by describing “Occasion and place”, then they shares thoughts on clothes matching by mentioning clothes details, such as “brand, color, and style”. Actually, they transform look into text format. Table below is an example that translated from Persian text message to English from one of our friend:

<table>
<thead>
<tr>
<th>A: Hi, what do you think about my black tight Miss Sixty jeans with red and black top, that I wear last time on xxxx party, for a tonight?</th>
<th>B: don't you think to wear another shirt with that jean? that one is good with skirt jeans I guess</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: so what about the white funcky shirt, or yellow and green one which has big flower at back?</td>
<td>B: uhhmmm I think it white one works better, with what shoes?</td>
</tr>
<tr>
<td>A: with a white high hills that I bought from Diesel</td>
<td>B: ahhaaa yes, I think that's the best choice</td>
</tr>
</tbody>
</table>

Table 1 Example of SMS Conversion on what to wear
5.3.1. Discussion on written notes

From the conversations, we noticed that individuals very interested and cared about their mobile phone device appearance. Currently mobile phone case, cover, or stickers are the available options that allowed individual to change the look of the device. Concerning the outfit-centric accessories concept, mentioned options are described as possible ways that individual able to match their mobile phone with outfit. We concluded these options are the answer to our second research question “how individual can match their phone with outfit?”

We became very interested in skin phone or sticker option among other options, because we noticed the relation between sticker and Morvey concept design. Interestingly, sticker and Morvey model shared the mutual notion of “skin” and “changeability” in appearance. We realized the virtue of changeability in Morvey design that inspired by chameleon skin functionality can apply to mobile device by sticker or skin phone.

This research shows the ways people interested to improve social activities around mobile phone visual appearance, which believe this is novel. From this part of the research we recognized possible options for system output elements for the outfit-centric accessories concepts were case, cover, and sticker (skin phone). Further on the system design section (chapter 3) we explained how we used these options in the application.

5.4. Design elements for outfit-centric accessories

The main intention that explained in this chapter was to identify design elements for outfit-centric accessories concept system design. Figure 26 represented the outfit-centric accessories concept at this point.

Among all elements that had been recognized in the field study, we considered elements below for outfit matching:
- Apply design and provide functionality in a usable way a user can visually see the match and able to put clothing and accessories together.
- User able to customize, modify, and apply changes in the appearance.
- User able to share the look through available social networking and other social services.
- Outfit and device matching could apply as sort of case, cover, sticker, or even background interface of device.

Mentioned elements were chosen as an input and output elements since they provided us with deep understanding of outfit “Matching Mechanism”. At this point, matching mechanism had been identified input elements of system design concerning the outfit-centric accessories concept that also explained in more details in the following chapter.

![Figure 25: identified input element of outfit-centric accessories concept](image-url)
CHAPTER 3

Phase two-

System-Outfit-centric accessories application design-

Outfit-centric accessories application development
6. SYSTEM

6.1. System Architecture

Research phase of this thesis has been provided varieties of input elements regarding the outfit-centric accessories system design and development. In this part of the project, we considered available ways to include input material in to the system and identified different input and output options as well as possible device. Picture below shows the structure and our views of the system.

Figure 26: Outfit-centric accessories System Architecture
6.2. Choose a System

The outfit-centric accessories concept is very new and still researchers and designers are struggle for identifying different applications, artifact, and services regarding this concept. In this study, we realized the best possible and available option for make changes in visual appearance of device is to use device services such as application. Recently, there is great interest in mobile application industries (Rogers, et al., 2009), therefore, one suited design solution appeared to use today smart phone functionality in context of the outfit-centric accessories concept. This means we have used existence technology and available devices to represent our design idea. As finial design decision and answer to third research question, we have decided to design mobile application system in order to provide a system that a user can match an outfit with a mobile phone. We also decided to frame input elements of design to output of the system.

Since this study aimed to presents new idea, we explored through available mobile application in Android market\(^6\) and App Store\(^7\) concern clothes and accessories matching in order to identify available services and applications in this area.

We named the application “Mobile Fashion”, in order to give the idea of fashion in mobile phone design. This application is enabling a user to enter clothes items by taking picture of the clothes or final look. Then a user can edit the image by cropping and selects specific part for matching. After matching look has selected, application enable a user to match a mobile phone with an outfit in a form of background image, cover, or sticker (phone skin). Also this application enables a user to share the look with other via social services such as Facebook and Email. We will discuss on input and output options of the application latter on this chapter.

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\(6\) [https://market.android.com/?hl=en](https://market.android.com/?hl=en)

6.2.1. List of available mobile match applications

This study has been shown that several mobile applications regarding outfit matching are available in Android Market and App Store, but nothing regarding outfit matching with the visual appearance of a mobile phone. Therefore, in application development we put our attention mainly to outfit and mobile phone matching. Table below is presented various applications reading fashion, clothes, and closet that helped individuals apply outfit matching. This collection gathered during March and May 2011, and keywords we used for search are clothes, matching, and fashion.

<table>
<thead>
<tr>
<th>Android Market</th>
<th>App Store</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outfit planner</td>
<td>iDress</td>
</tr>
<tr>
<td>Fashion camera</td>
<td>iWardrobe</td>
</tr>
<tr>
<td>Mobile closet</td>
<td>iWore</td>
</tr>
<tr>
<td>Do it yourself fashion design</td>
<td>Style tips</td>
</tr>
<tr>
<td>Victoria clothes organizer</td>
<td>Stylebook</td>
</tr>
<tr>
<td>My clothes</td>
<td>Go try it on</td>
</tr>
<tr>
<td>Dress Me Up Lite</td>
<td>Wardrobe assistant</td>
</tr>
<tr>
<td>Miss Droid Lite</td>
<td>My closet</td>
</tr>
<tr>
<td>My Style Shopper</td>
<td>Dream closet</td>
</tr>
<tr>
<td>My wardrobe Lite</td>
<td>Wardrobe!</td>
</tr>
<tr>
<td>Dress up and Make up</td>
<td>Closet Lite</td>
</tr>
<tr>
<td>Dress making</td>
<td>What should I wear?</td>
</tr>
<tr>
<td>Change my style</td>
<td>My fashion style assistant</td>
</tr>
<tr>
<td>Pattern design</td>
<td>Cool guy</td>
</tr>
<tr>
<td>Dress making, beginners guide</td>
<td></td>
</tr>
<tr>
<td>Fashion</td>
<td></td>
</tr>
<tr>
<td>ANDRESS</td>
<td></td>
</tr>
<tr>
<td>Fashion diary</td>
<td></td>
</tr>
<tr>
<td>What to wear</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 clothes matching and style application in Android Market and app store, May/March 2011
6.2.2. Reflection on input options

The “Mobile Fashion” application is aimed emphasizes new ideas on device and outfit matching rather than outfit matching itself. Therefore, the Mobile Fashion application is not presenting clothes matching in this version. Moreover, one of the technical limitations that identified regarding the application was possible options for entering clothes item in to the mobile phone. In this case, we recognized four possible ways for this application to input image data in application:

1) Using item recognition techniques
2) Using barcode reader or NFC (Near Field Communication) tag to recognize clothes (this way was not convenient since not all the clothing attached with NFC tag or barcode may not be readable.)
3) Loading clothes image from the internet through the brand website
4) Taking a photo with phone camera

We decided to choose a photo options as input mechanism in the Mobile Fashion application based on two reasons: first, many devices attached with very good quality camera and people familiar with their phone functionality, therefore, this is much easier and faster way for users to input and store clothing image to mobile phone. Second since we requested to present demo of the application in this thesis, camera options recognized as more convenient method. This application is not completed yet and lunching the application postponed (see figure 27).

6.2.3. Reflection on output options

Output options has selected from available accessories and applied in visual part of the device. We mentioned earlier, these options also identified from the field studies. Since, the outfit-centric accessories concept suggested application that changes by a variety of clothing as necessarily requirements for design, we recognized apply any changes in the device hardware part, such as back or side of phone,
impracticable. Therefore, this application output options defined three possible ways:

1) Background image in phone interface
2) Cover/Case
3) Sticker (phone skin)

Currently, the first option is functional in the application interface, but the only problem is interface of the device is not the mostly visible part of the device for the visual representation. Moreover, options two and three still need to improve in functionality. Unfortunately, these options require additional requirements such as special printer and mobile phone cover producer.

Moreover, the Mobile Fashion application is offered various social services for social practices simply by sharing a photo with friends and family via email, Bluetooth, and social networks such as Facebook and Twitter (see figure 27).

6.2.4. Android Operating System

Android is the name of the Google operating system for mobile phones, smart phones and tablet devices. Android is considering as a very powerful open source programming environment that grows every day. In android environment, people are sharing the source code freely and assisting each other for developing mobile applications. In addition, distributions accomplished freely and applications review is not needed in Android framework. Meier (2010) suggested android system as very good opportunity for the developer who wants to grow in this field:

“Built on an open source framework, and featuring powerful SDK libraries and an open philosophy, Android has opened mobile phone development to thousands of developers who haven’t had access to tools for building mobile applications. Experienced mobile developers can now expand into the Android platform, leveraging the unique features to enhance existing products or create innovative new ones.” (Meier, 2010, p. 29)

Considering mentioned benefits and advantages of the Android operating system that also available in other references [ (Garrett,
“Mobile Fashion” Application

2011), (Meier, 2010), (Rogers, et al., 2009)], the “Mobile Fashion” application designed and developed in the Android operating system.

Figure 27: Mobile Fashion System Architecture
7. OUTFIT-CENTRIC ACCESSORIES APPLICATION DESIGN

7.1. Challenges in the Mobile User Interface Design

User Interface design is demanding task because of hardware and software capability in different devices. The mobile phone hardware and software has been changing rapidly due to technological growth. These transformations are causing other changes in the mobile phone generation, such as device appearance as well as device interface size and capabilities. Current mobile technology gives an opportunity to everyone to design and develop their own application in order to fulfill a user needs (Morris, 2011). Moreover, mobile phone interface also turns into interactive interface that visually very similar to computer interface but in smaller screen size, with touch interaction, and many other functionalities.

With limited screen size of mobile devices designing an application is becoming even more challenging (Das, 2010), i.e. it is trickier to design high usability and effectiveness application with simple interaction and attractive design in small display.

7.2. Graphical User Interface Design

The Graphical User Interface associated to the part that a system and a user can communicate through it, i.e. through user interface a user can interact with technological system or artifact. Therefore, by interaction a user can control, manage, and use an interactive system or artifact. Galitz (2002) defined Graphical User Interface as “Collection of techniques and mechanism that the user used to perform an action, such as selecting, pointing, modifying and manipulating the object, in order to interact
with the object. Object is a collection of element in the system that can see, hear, and perceive”. (Galitz, 2002, p. 15)

Several guidelines and tools have been implemented for design a “Good” User Interface [(Galitz, 2002), (Dahlqvist & Norman, 2006), (Wood, 1997), (Johnson, 2010)]. Many computer and cognitive scientists, usability experts and computer engineers such as Norman, Shneiderman, Smit and Mosier, and Brown have designed and defined roles and guidelines for designing a good Graphical User Interface. These guidelines has considered a user perception and cognitive activities, system visualization and informative system feedback, consistency in actions and easy and fast learnable techniques as well as various interaction techniques for designing effective, usable, and successful Graphical User Interface [(Galitz, 2002), (Dahlqvist & Norman, 2006), (Wood, 1997), (Johnson, 2010)].

7.3. “Mobile Fashion” Application Design Process

Design phase of the application had begun with sketching and low fidelity prototyping methodologies. As we stated in background study (McCarthy & Wright, 2004) (Dalsgaard & Hansen, 2008), design phase had followed aesthetic experience design by focusing on the aesthetic experiences that emerged as appealing “sensual” and “emotional” feeling regards the “look and feel” as well as usability of the system. Design procedure followed “eight golden roles” by Schneiderman for interface design [(Galitz, 2002), (Dahlqvist & Norman, 2006), (Wood, 1997), and (Johnson, 2010)]. In design, we had also focused on applying the outfit-centric accessories concept requirements as well as enhancing the system functionality from different perspectives that described below:

- Presenting main idea, usable interaction design and correct functionality, and present possibility to match clothes and mobile phone.
- Apply beauty and attractiveness in appearance and interaction by adding sound for button press and intro page, beautification
of main items and icons of the application, provide accurate and ease-of-use system, and:

- Increase the feasibility of the application by simplicity in interaction and system feedback, also correct mapping design and easy error handling.
- Considering social services in design application that provide user to “share” with friends and relatives through social networks, email, and Bluetooth file transfer.

Further in this section, we will describe each stage of the mobile application design. Design phase contains application wireframe, click stream, and sitemap with the aim of designing consistent, reliable and efficient application.

### 7.3.1. Low fidelity Prototype

For the design and development of “Mobile Fashion” application, several paper prototypes have been prepared (Figure 28). Earlier in the method section stated paper prototype as very fast and an efficient technique that applies mainly for design artifact or interactive system. We applied several paper prototypes in user testing in order to increase usability of the system.

![Figure 28: Paper prototype for “Mobile Fashion” app](image)
7.3.2. Wireframe

Wireframe is a technique that presents the visual representation of the web and mobile application in sketching form and shows navigation between different elements of application content. Brown (2011) defined wireframe as “A simplified view of what content will appear on each screen of the final product, usually devoid of color, typographical styles, and images. Also it is known as schematics and blueprints” (p. 166). This technique in design provided us with understanding the behavior and system functionalities. Moreover, it shows the relation between different screens of the application (Garrett, 2011) (see figure 29).

Figure 29: “Mobile Fashion” application wireframe
7.3.3. Click Stream

Click stream considers as a very helpful technique for reducing redundancy in design. We applied this technique to decreases the number of error in application. Click stream present the clickable part of the web and application and shows click path of application (see figure 30).

Figure 30: Click stream for “Mobile Fashion” application
7.3.4. Site Map

Site map is other technique for representation of the web and mobile application in early design stage. Brown (2011) described site map as “A visual representation of the relationships between different pages on a website. Also known as a structural model, taxonomy, hierarchy, navigation model, or site structure” (p. 94). As Brown also defined, site map only represents the relation between different pages of the application in organized and hierarchical fashion. In order to provide representation of the relation between different parts of the Mobile Fashion application, we designed the site map of the application (figure 31).

Figure 31: “Mobile Fashion” sitemap
7.4. User Testing

With the paper prototyping we arranged several sessions for testing the application. At this stage, we gathered five users with various backgrounds to test the application prototype. Moreover, we asked them to think aloud while performing different activities so that helped us to recognize feasibility, efficiency, consistency, and difficulty level of the application.

During user testing, “Quick and Dirty” evaluation technique had been applied and changes maintained during testing. With this evaluation technique, simply with the help of pen and paper, all the comments noted and paper prototype edited and modified and then changes applied till we reached the final design version. Table below presents users feedback regarding the Mobile Fashion application.

<table>
<thead>
<tr>
<th>Participants backgrounds</th>
<th>Feedbacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 Cognitive science</td>
<td>Add note on main page for add new items, add take photo option in main menu, shows possible ways after image cropped</td>
</tr>
<tr>
<td>P2 Cognitive science</td>
<td>Add as background option in all clothes menus, shows all option for match on the last page, remove favorite button</td>
</tr>
<tr>
<td>P3 Interaction designer</td>
<td>Add take photo option in main menu, add possible way after image cropped</td>
</tr>
<tr>
<td>P4 Nano-technology</td>
<td>Make image bigger after take a photo, add background image in all clothes menus</td>
</tr>
<tr>
<td>P5 Interaction designer</td>
<td>Add as background option in all clothes menus, remove favorite button</td>
</tr>
</tbody>
</table>

Table 3 comments from user testing on Mobile Fashion application paper prototype
7.4.1. Results from User studies

The purpose of the user study improves system by understanding how a user interacts with the system. Users shown a great interest for using the application and emphasized the efficiency of a system. P1 said “application seems very easy and looks interesting and beautiful”, but she have confusion to add new item in the application and to find options after modifying image so application provide short hint on how to add new item. Moreover, P1 and P3 both said they have difficulty to finding the possible options, especially taking photo option, in the application so we decided to provide all option in the same place in menu. P5 and P2 were very interested the background image options and she preferred to “have this option in each clothes category”, therefore, thus this option is available in all categories. Moreover, favorite option removed from application since P2 and P5 both have confusion on favorite option, P2 stressed “items that I add in this application are usually my favorite look, so why do I need to separate them, prefer not to use that option”, P5 pointed out the same thing but he also added “the most important thing here is to be able to save the look so we have this option why we need favorite option then”.

Application provided all possible option for matching in the same place since P1, P2, P3, and P4 are all suggested that so they can easily chose the preferable option simply. In addition, as P4 also reflected, the size of the token image in application can increase according to the preferable look.

7.4.2. Discussion on design techniques in evaluation

Techniques that had been applied in a system design and evaluation fulfill the need of the project. Even though paper prototyping gives users the impression of what the real system will look like through sketches, results from user testing had shown that this application can provide easy and usable application for the outfit-centric accessories concept and users shows a great interest for using the application in future.
8. OUTFIT-CENTRIC ACCESSORIES APPLICATION DEVELOPMENT

8.1. Application Development process

The final step of this master thesis had begun with development of the mobile application. Application development accomplished with the help of Object Oriented Programming technique in Java programming environment and design tools such as Adobe Photoshop in Android based operating system for mobile devices.

8.1.1. Interface Design and Implementation

At this stage of the development process, we realized it is very important to present beauty, attractiveness, and aesthetic characteristics of the application in the both interaction and appearance application. Therefore, development process had begun by preparing graphical interface design and implementation of different content of the application. Icons and other visual parts of the mobile application had been designed by using Adobe Photoshop. Adobe Photoshop is the program for designing, creating, editing graphical features. This tool considers as one of the strongest working graphical environment with many different options.

8.1.2. Development procedure

As stated earlier, we chose to use camera as input method in the development process. Moreover, we chose eclipse for programming and developing mobile application.
• **Eclipse**\(^8\) is application development tools that support multi-programming languages. This application mostly use for Java programming.

• **JAVA**\(^9\) is a programming language that is designed with syntaxes that is very similar to C and C++ programming language but in an appropriate manner. Java considers as one the very famous and strong language that used mainly for developing various types of computer, mobile, and tablet applications.

• **XML**\(^{10}\) is Extensible Markup Language that basically used for interface of the web and mobile and many other applications.

### 8.1.3. “Mobile Fashion” Application Expression

Here, pictures of Mobile Fashion application presented (see figure 32, 33).

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\(^8\) [http://www.eclipse.org/](http://www.eclipse.org/)
\(^{10}\) [http://www.w3.org/XML/](http://www.w3.org/XML/)
Pictures from 1 to 12, present functional parts of the “Mobile Fashion” application. In this application, user simply by taking photo of her/his clothes can match mobile device with outfit.
Figure 34: the final result

The mobile application that provide mobile phone and outfit match for the user
CHAPTER 4

General reflection-
Discussion- Conclusion- Future work
9. DISCUSSION

The results of this study lend credence for further research on the design exploration concern the outfit-centric accessories concept through Experienced-Centered Design approach and wearable computing area.

To design for the concept, study begun by delivering conceptual design that has suggested wearable kind of mobile devices with changeable and adoptable qualities in visual part of the device. The study shows that there is connection between outfit-centric accessories concept, mobile phone design, and wearable computing.

Study followed by field study that has shown that there is validity in applying the same elements of outfit matching into mobile phone and outfit matching. The analysis and findings from field studies were pointed to elements that were very beneficial practical design and development process. Moreover, the possible ways people interested to expand social activities for device and outfit matching has a great value in this study. Based on the results, the Mobile Fashion application presents the possible way with using today’s technology for match outfit with mobile phone appearance. It is worth mentioning that participants in user testing were very interested to using this application in future.

In this section, we will discuss the results of this master thesis study. Explicitly, we will discuss regarding field studies finding, especially match mechanism, social activities around outfit matching, and limitation of design. Furthermore, we will elaborate answers to research questions concerning the outfit-centric accessories system design.
9.1. Discussion on aesthetic experience

We concluded the beauty and attractiveness as well as usability are the vital features in outfit-centric accessories design. This study perhaps shows the importance of usability, beauty and attractiveness features of design in emerging aesthetic experiences.

Mobile Fashion application designed based on clear set of the outfit-centric accessories requirements. In practical design part of application, we developed easy interaction and beauty and attractiveness as a visual part of the application (icons and application interface). As the author of thesis, my experiences in art allowed express my ability in design and represent aesthetical features in more artistic and fashionable way.

Moreover, easy and usable interaction design had been applied in the mobile application that expressed the beauty that involved in the ease-of-use of the application. Despite the fact participants tested on paper prototype of the application, they specifically referred to the beauty features and attractiveness. In addition, users directly declared the simplicity in interaction and ease-of-use in order to express their feelings.

9.2. Discussion on results from field studies

The vast amount of replies and entries in field studies has indicated a great interest of participants in relation to phone and outfit matching. Collection of data through Blogger and Facebook community page indeed was the best resources that we could use for gathering data concern the fashion and the mobile phone design. As a matter of fact, blog and social networking website like the Facebook are perfect places for collecting input entries data. This fact also aligns with Juhlin and Zhang (2011, p. 248) discussed on the important role of online media in relation to fashion and mobile.
We concluded results from user studies part of the thesis were very interesting and led to understanding the outfit “match mechanism”, as declared in this study same elements applied for outfit and mobile matching. In the following we will discuss about the match mechanism explicitly.

9.2.1. Discussion on match mechanism

Field study shows that there is validity in applying the same elements of outfit matching into mobile phone and outfit matching. After data collection, we developed seven groups through qualitative content analysis method as input elements of design from input entries data. These groups were defined in section 5.1.1 are: 1- Putting things together, 2- Personal style, 3- Clothes and accessories look, 4- Color harmony, 5- Occasion and place, 6- Mood and feeling, and 7- Fallowed fashion. We arranged these groups in to two main input elements of for practical design process. One important input element of system design explained in a way a user can visually see the match and able to put clothing and accessories together. Second input element of designed defined by combination individuals’ taste, emotion and feeling, and their situation while creating the look. Moreover, results from survey also showed people interest in the mobile phone design especially in the relation with fashion. In addition, survey results were added the importance of social practice around outfit matching.

We concluded that the “Match Mechanism” or the “mechanism of outfit matching” defined by the elements that explained the ways users creates an outfit image by putting clothes together according to his/her taste. We also identified matter of people taste and personal style as well as mood and feeling of a person at the moment have a strong influence in match mechanism. Match mechanism also explained by social practices that involved in outfit matching, like neediness of sharing the look with others and asked people opinion about what to wear and how to match clothing.
Mobile Fashion

Match mechanism had been helped in this study to understand exactly how people create an outfit of a day. Considering the relation between mobile phone and outfit matching and the fact that mobile phone in this concept became as sort of accessories, perhaps system can followed the same behavior for mobile phone and outfit match mechanism. Therefore, in the “Mobile Fashion” application we provide this match mechanism for users by giving them option to take photo of the look of the outfit and create the matched look for mobile phone.

Furthermore, study proved that social practices around clothes matching are very interesting and perhaps there would be the same interest in mobile phone and outfit matching. In the following section, we will discuss more about these social activities.

9.2.2. Social activities around the outfit matching

Considering outfit match mechanism, study has shown there are several social activities like communicating and sharing thought and asking other’s opinion involve for matching and influence people decision on outfit matching. We found out these activities are very common among fashionable people and strongly influence their taste and decisions on outfit matching. Moreover, study has declared people often use the mobile device services, such as texting, video call, email, photo sharing, in order to share the look.

Of course mentioned social practices are not new in outfit matching, but in relation to mobile phone appearance is something that perhaps not think through so far and we think it is very interesting for future mobile design. Therefore, we concluded that the outfit-centric accessories concept raises a great opportunity to improve social activities in this area.

In the Mobile Fashion application we developed the “share” options for fulfill needs of individuals in social practices. We believed social practices in this sense can developed new sort of activities around mobile visual representation. As a result, this study added the
importance of social activities in outfit-centric accessories concept in addition to innovative design practices for future mobile phone.

**9.2.3. Limitations**

Design exploration for the outfit-centric accessories concept lead to some insight into the connection between the concept and wearable computing, but the structure of this study lead to many limitations how the finding can be used in system design and development with today’s technology.

Although the study was attempting to fit the outfit-centric accessories requirements and Morvey concept features into the Android based mobile application, there are issues with input and output options. As discussed, devices should equip with camera as an input option and output options identified as background image, case/cover, and phone skin. Another limitation in this relation is producing output options. Since these options required additional services such as producing and delivering cover/case and phone sticker, there are still some issues on how the application can provide such services.

In general, this research act as delivering designs solution for the outfit-centric accessories concept as mobile application. And also suggests the relation between the concept and wearable computing. Results and design exploration could have been carried out in number of different ways for further exploration with regards to the outfit-centric accessories concept.

**9.3. Answers to research questions**

Below we provided the list of the research questions that also presented in section 1.3 with their answers:
▪ How people match their clothing and their accessories with clothing?

Answer to this question was explained in several part of thesis by definition of the outfit match mechanism (sections 5.1.2, 5.2.2, and 9.1.1). Match mechanism described by the social activities (like asking other opinion and sharing the look) and the ways individuals putting clothes together where they can see them according to their taste, personal style, mood, and feeling at the moment.

▪ How people can match their phone with their outfit?

Study suggested mobile application that enables outfit and mobile matching. Answer to this question was explained in the part of the user study (section 5.3.1) that participants created device and outfit matching by using case or cover, and sticker. We concluded that cover/case and phone skin are available options that currently people use for matching and make their own device unique and recognizable.

▪ How to find a proper way to transform the mobile phone as sort of accessories that can match easily with outfit?

With regards to today’s technology, study recognized developing application in this relation can fit with the need of the project and expressed the idea. In the Mobile Fashion application the concept of matching outfit and mobile phone together is quite new that perhaps not considered up to now. From technical part, this application mainly is benefited from the available services and equipment in other context.
10. CONCLUSION

This study shows the evidence that there is validity in applying outfit matching elements in mobile phone and outfit matching. The match mechanism and social activities around the outfit matching expand further design opportunity for the outfit-centric accessories concept.

In this thesis, the Mobile Fashion application presented one of the possible ways of match outfit and mobile phone with using available technology. As per this thesis, it appears new insight on how usability, beauty, and attractiveness in relation to mobile design accounts for aesthetic experience. The Mobile Fashion application designed aesthetic of interaction in a beautiful expression and easy way and enabled the user to match mobile phone with the unique part of the outfit and share the look with other.

This study suggested the relation between the outfit-centric accessories, mobile design, and wearable computing. This will suggest new link in relation to the outfit-centric accessories concept and may possibly increase opportunity in future wearable mobile device.
11. FUTURE WORK

In this thesis, inspiration had been raised from changes in Chameleon skin. We suggested the future digital and hardware materials that could possibly make changes in shape, color, and pattern. Having such materials in future may increase chances on the outfit-centric accessories concept and the mobile phone design. Moreover, the importance of users “emotion” and “feeling and mood” in the outfit match mechanism may possibly increase the opportunity to involve Affective Interaction in HCI domain in the outfit-centric accessories concept. Perhaps, in future many applications can design from Affective Interaction perspective that recognized a person feeling and mood and suggest the clothes and color and matched mobile case to a user.

Concern the Mobile Fashion application: we suggested additional services such as location based services to find the store for buying case/cover and sticker. We suggested various improvements in social services by improving services such as adding text messaging and video call services. In this way may possibly increase social capabilities in the application regarding the outfit-centric accessories concept. Moreover, some future work has been suggested from the technical perspective for the Mobile Fashion application. One is to increase system capabilities by adding image and pattern recognition system and provide system suggestion services to find location where user can buy case/cover, and stocker. Further, using other ways of input, such as barcode reader or NFC/RFID tags, image recognition, and using clothes brand website, also recognized as other possible way to increase input options.
12. Bibliography


Boehner, K., Sengers, P. & Warner, S., 2008. Interfaces with the ineffable: Meeting aesthetic experience on its own terms. 15(3).


CHAPTER 6

APPENDIX

Survey questionnaire-Vinnova-nyth-Static Intelligence Conference
“Mobile Fashion” survey questionnaire

mobile phone and fashion

Many mobile phones offer an attractive design to go along with various features. Today's cellphones are not only used for entertainment and business but have also transformed into fashion accessories. This is survey about outfit centric design of mobile fashion.

Please answer to the following question.

Thank you!

1) 1. How old are you?
   - under 18
   - 18-25
   - 26-32
   - 32-40
   - 41 or older

2) 2. What is your gender?
   - Female
   - Male

3) 3. How you decide what to wear? (give priority between 1 -6, 1 is the most priority and 6 is the least priority)
   - Depends on the weather
   - Depends on the occasion
   - Depends on the place
   - Depends on my mood
4. How you match your outfits?

- It depends on my mood, I usually choose different colors in different moods
- I like to be casual, wear jeans with simple color shirt/jacket/… I like to be simple and comfortable
- I like to be fashionable, I try to match my outfits with what is fashionable
- I like to be unique and different, and I try matching new things most of the time, sometimes it’s fashionable and sometimes it’s not!
- It depend on the color, I try to match color together

Other (Please Specify):

5. Have you ever discussed to your friends or family about what to wear?

6. If YES, Please tell me in what way you prefer to discuss with them?( give priority between 1-6, 1 is the most priority and 6 is the least priority)

- Talking on the phone
- Sending text message SMS/MSM
- Video call
- Sharing photo (via mobile phone or computer)
- sending Email
- Face to face conversation

7. Who would you prefer to ask about what to wear?

- friends
- family members (mother, father, sister, brother, ...)
- designers
- I would try to discussed with people I don’t know via social media like
8. Do you think your culture is effect on what you wear? How?

Other (Please Specify):

9. How you match your accessories (watch, earrings, bags, necklace, bracelet, and ring) with your clothes?

- Depends on color
- Depends on material (gold/ silver)
- Depends on what is fashionable
- Depends on fashion designer (Gucci, Channel, Armani)
- I don’t use accessories

Other (Please Specify):

10. If you would like to add something, please write your comment here for me. Thank you for your time.

Finish Survey
A workshop paper by Zhang, Juhlin, and Kashanipour (Author of this thesis) also accepted in workshop on Aesthetic Intelligence in Amsterdam in November 2011 which also presented in Springer’s Communication in Computer and Information Science. Workshop paper defined Outfit-Centric Accessories, and “Mobile Fashion” application presented as current application regarding the outfit-centric accessories concept.

‘Outfit-centric Accessory’ Design in Mobile Innovation

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Abstract Mobile phone design and use is a good case for studying aesthetics in human computer interaction, since this technology provides intimate consumer interaction. Still, the ways in which such technology could attract to fashion oriented people, has been under developed. The industry is making efforts to approach this group by treating phones as accessories. However, to design a mobile phone as an accessory does not just mean to make a phone “beautiful” in a static way, but should allow for matching its appearance with users’ outfits in a dynamic and interactive way. In this paper we present the concept of outfit-centric accessory and explore a possible way of realizing it in design practice. We present a demo of designing a „match” application and discuss the advantages and problems of the app. This study provides valuable insight on how we should design mobile experiences to enhance aesthetics close to our body.

Keywords: outfit-centric accessory, mobile design, aesthetics, match application

1. Introduction

Mobile phone design and use is a good case for the study of aesthetics in human computer interaction, since it provides us with intimate consumer interaction. Still, the ways in which such technology could interact ambiently to provide for aesthetically pleasing experiences among fashion oriented people, has been under developed. The industry is making efforts to approach the groups by treating digital devices as accessories. We argue that these attempts are superficial and that the industry has not yet allowed the phone to succumb to the elaborated aesthetics as it is expressed in users’ selection of clothes made available by the fashion industry. Designing a mobile phone as an accessory means more to make the visual appearance of a phone „beautiful”. In this paper we present the concept of outfit-centric accessory and explore a possible way of realizing it in design. We will present a demo of a „match” application and discuss the advantages and problems of the app.

2. Outfit-centric Accessory
In previous studies, we have found a mismatch between how the telecoms sector approaches fashion as a resource for design, and how the fashion oriented people themselves approach such designed objects. In fashion, an accessory is something that adds to the outfit or the clothing. It is often a watch, a bag, or piece of jewelry. Designing for the mobile phone as an accessory implies that it should be an integral part of the outfit or the whole look. However, in the mobile phone industry, it is often the device that is the center of attention. It can be called “phone-centric” accessory. Accessories then become things that are attached to the phone, such as cases, charms etc.

The co-existence of these perspectives might lead to the conclusion that mobile phones have already been used as fashion accessories but with incompatible meanings in the two industries. We argue that treating an object as part of a style has other implications than selecting objects to match the phone. For instance, accessories in the outfit-centric view need to fit with variations in clothing styles which have a much faster turnaround than how often a device is changed. We suggest that mobile design expand on the idea of outfit-centric accessories, which then would focus on matching the visual appearance of the digital device with the outfit of a person.

Given the previous study, we identify two further requirements on such an application, i.e. it should draw upon a visual aesthetics and in such a way that it is publicly available. First, we argue that the aesthetical considerations should focus on visual, since this would fit with the appeal of the users whose comments on the aesthetic of the phones were on visual expressions. Second, the visual features should be publicly available. This argument is grounded in the observation that the parts of the phones that attracted their aesthetic interest were often the back and the sides, and those parts are also visible for others. This is also in line with fashion theory, since fashion is necessarily “public” and “secret fashion is a contradiction in terms”,4, and making visual features publicly available will be a critical problem if a user wants to make a fashionable statement with the phone.

3. Experimenting the Concept

3.1 Current design

Currently, there are some designs that fit the concept of outfit-centric. For instance, mobile skins and covers, people can customize the phone by wrapping it with artistic-designed skins. It is an easy way to change the look of a phone according to your clothes. The covers have the same function as match the colors or prints to your clothes. Another example is to make a phone into a wristwatch or necklace etc. The strategy here is to transform the form of a mobile phone into a wearable kind.

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3 Ibid.
From the current designs, we find that there exist some problems: first, it can be inconvenient to change the hardware of a mobile phone. You need to buy extra products which you like in order to change the look. Second, the concept of match here is completely up to the user, as it is the user that changes the settings or hardware as he wishes. Then the sense of fashion and aesthetic taste of the users matter a lot in the quality of matching between the phone and the clothes.

### 3.2 Match application prototype

![Prototype of Match Application](image)

**Fig. 2 prototype of Match application**

Figure 2 shows the simple demo of the Match application. This application prototype shows our idea of matching in design. First, it creates a large data of the consumer’s clothes, categorized into dress, skirts, shorts, trousers, tops, blouses etc. Second, when you decide which outfit to choose, you can choose the patterns which you are interested in on the clothes, then the application could make it into an optimized picture which you can set as the background of the phone or print out a sticker for the cover of the phone. You can make the decision on what to match. For instance, you can match the phone with your top, your jacket or your trousers.

Our ambition is to design an application that can make a phone aware of the change of matching automatically which can show on the hardware. The current demo is a first step to reach that goal. There are things that can be improved:

First, more options: if you want to match the color of the top, the pattern of the shorts, then the app should be able to integrate the requirements into one picture. Another option is that it does not necessarily look the same as the pattern you have chosen, the application can give you a different image but with the same style, based on the judgment of the style of the clothes you have chosen, e.g. navy, nature, nude, bright, floral etc. If two outfits share the same style, the image shown could be the same.

Third, better solutions on the output of the images: after you have created the new image on the application, you need to make it public available as a fashion statement. So far, it is not possible to change the cover automatically since the materials used to make phones are limited in this aspect. Printing out sticker is a simple way to explain our idea but it is limited to connection with printing machine and suitable paper for making stickers, thus not very practical at this stage.

In conclusion, the prototype demos the outfit-centric concept well and it has almost solved the two problems of the existing design: one is the inconvenience of changing the covers all the time, the other one is the importance of subjective taste. In this prototype, you don’t need to buy new covers, but just need to have new stickers; and you don’t decide how the phone will look like, but the system chooses the right image for you to match the outfit. However, the demo also has many problems that need to develop. For example, the chosen image could be more diversified; how to create a more efficient cover change in order to match the variation of the clothes is still a problem. Second, match mechanism: there are many reasons and ways for people to match the outfit. They may talk with their friends, family, community over the phone, by sending pictures, messenger etc. People also care about color, weather and occasions etc. All of these can influence on what they will wear and how they match the phone with the outfits.

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*We have also conducted a questionnaire asking people how they match their clothes and got a lot of valuable data, but we are not talking in detail here. The materials we have got will lead to another new study in the future.*
The demo basically decides the „match” for you. However, if we take into consideration of other options or ways to decide „match” in a more social sense, the application will be more interesting. Third, better solutions on the output of the images: after you have created the new image on the application, you need to make it public available as a fashion statement. So far, it is not possible to change the cover automatically since the materials used to make phones are limited in this aspect. Printing out sticker is a simple way to explain our idea but it is limited to connection with printing machine and suitable paper for making stickers, thus not very practical at this stage.

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4. Conclusion

In this paper, we see mobile phone design as a good case to study aesthetics of Ambient Intelligence. We think it is important to take the concept of „outfit-centric accessory” more seriously, paying attention to the concept of „match”. We explored a possible way to use the idea in design practice. We presented a demo of designing a „match” application which has shown the two features of the outfit-centric view, but we also have discussed the problems of the application. In the future study, we look forward to improving the application. This demo can be seen as a first attempt to design the concept of outfit-centric accessory. Although it has flaws, it still provides new insight on how we should design mobile experiences to enhance aesthetics close to our body.

References