TECH FASHION

Yanqing Zhang

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| Tech Fashion |
| Unpacking Fashion Institutionalization in Digital Technology |
| Yanqing Zhang |

# Abstract

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To my dearest grandmother Cuiqun Han and mother Yingjie Xu.

This thesis explores aesthetization in general and fashion in specific that occur in the design of digital technology and how we could design digital technology to account for the extended influences of fashion. It applies a combination of methods to explore the new design space at the intersection of fashion and technology. First, it contributes to theoretical understandings of aesthetization and fashion institutionalization that influence the design of digital technology. We show that there is an unstable aesthetization in mobile design and the increased aesthetization is closely related to the fashion industry. Fashion is emerged through shared institutional activities, which are usually in the form of action nets, in the design of digital devices. “Tech Fashion” is proposed to interpret such dynamic action nets of institutional arrangements that make digital technology fashionable and desirable. Second, through associative design research, we have designed and developed two prototypes that account for institutionalized fashion values, such as the concept of “outfit-centric accessory”. We call for a more extensive collaboration between fashion design and interaction design.

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# Contents

Abstract v

Acknowledgment vi

Contents viii

List of figures x

1 Introduction 13

1.1 Associative design approach 16

1.2 Unpacking aesthetization and fashion in the design of digital technology 17

1.3 Designing for “Tech Fashion” 20

1.4 Contributions 21

2 Theoretical Background 23

2.1 Aesthetic theories 23

2.1.1 Beauty in the objects 23

2.1.2 Beauty in the mind 24

2.1.3 Beauty in relations 26

2.1.4. Aesthetics in human computer interaction (HCI) 28

2.1.5 Conclusion 33

2.2 Fashion studies 35

2.2.1 Fashion in clothing 35

2.2.2 Fashion in the mind 36

2.2.3 Fashion in relations 37

2.2.4 Fashion in HCI 40

2.2.5 Conclusion 42

2.3. Fashion studies and aesthetic theories 44

2.4 The body 46

2.5 Conclusion 48

3. Methodology 50

3.1 Periodization 52

3.2 Interview 54

3.2.1 Sampling 55

3.3. Qualitative content analysis 57

3.4 Building prototypes 58

3.5 Ethical issues 60

4. Unpacking Aesthetization and Fashion in Mobile Design 62

4.1 Aesthetization in the history of mobile design (Paper I) 62

4.2 Unpacking fashion in mobile design (Paper II) 66

4.2.1 Shared institutions between mobile design and clothing fashion 67

4.2.2 Mobile fashion as action nets 68

4.3 Mobile phone in the fashion system (Paper III) 70

4.3.1 Online media put fashion into mobile phone 71

4.3.2 Understanding experience with mobile phone in fashion practice 72

5. Designing Fashionable Technology 74

5.1 Conceptualizing “Outfit-centric Accessory” (Paper III) 74

5.2. Design exemplars 75

5.2.1 Shape-switching device (Paper IV) 76

5.2.2 “Watch for Figuracy” (Paper V) 76

5.3 Design implications 78

5.3.1 Mobile fashion beyond hard covers and stickers 78

5.3.2 Designers and styles 79

5.3.3 The social context of fashion aesthetics 80

5.3.4 Designing for variations in dressing practices 82

6. Discussion 84

6.1 Pragmatist aesthetic theory revisited 84

6.2 Proposing “Tech Fashion” 87

6.3 Designing for “Tech Fashion” 89

7. Conclusion 93

8. Summary of Papers 95

8.1. Paper I: The life and death of great Finnish fashion phones- A historical periodization of changing style in Nokia phone design between 1992 and 2013 95

8.2. Paper II: Fashion in mobile phone design– The emergence of beautification, desirability and variation through institutional collaboration 96

8.3. Paper III. Unpacking Social Interaction that Make us Adore- On the Aesthetics of Mobile Phones as Fashion Items 96

8.4. Paper IV: Fashionable shape switching: Explorations in Outfit-centric design 97

8.5. Paper V: Fashion intelligent wearables: Apps and services for smart watches 98

8.6 Related publications: 98

9. Bibliography 100

Appendix 1 112

Appendix 2 113

# List of figures

Cover image: photo by Anneli Sandberg

Figure 3-1 An overview of methods

Figure 4-1 The number of models in manifest forms each year between 1992 and 2013.

Figure 4-2 Grouping the manifest forms into periodization categories

Figure 5-1 The 22 mock-ups that represent different shapes and colors within a “Shape-switching device”

Figure 5-2 The system of "Watch for Figuracy"

# 1 Introduction

Aesthetics is not a human luxury, but a universal human desire.

-----Virginia Postrel

Human culture has always been oriented toward what is considered to be attractive and beautiful. Philosopher George Santayana states that: “…the sense of beauty has a more important place in life than aesthetic theory has ever taken in philosophy” (Santayana 2002: 1). Human beings do not pursue their aesthetic desire only when basic needs have been satisfied. Beauty is almost everywhere in our life: we stop by a fashion store to appreciate the nicely designed windows; we decorate our smart phones to make them look more beautiful; we hang paintings on the wall or put flowers in a vase for our home; we eat food with beautiful porcelain plates and shining stainless steel forks; we like to go to a café with stylish interior design …… We are living in a world where our aesthetic demands and ideology are projected into the objects around us. It is a society of the “spectacle”, the “display”, the “design” and the “icons” (Sztompka 2012).

Aesthetics concern the creation, understanding and appreciation of beauty and art (Dickie 1974). We should not take aesthetics for granted, as if they were merely beautiful surfaces or had not been institutionalized at some precise moment (Benjamin 1968: 10). This will restrict our understanding of everyday aesthetics. In academic, scholars have observed and discussed the pervasive beauty and the demands for aesthetics in modern life. Sociologist Mike Featherstone claims that there is an abundant “aesthetization (aestheticization) of everyday life”. Since the late 20th century there has been a growing trend whereby many consumer products, such as home ware or technical gadgets, become part of a “constant search for new styles, new sensations and experiences” (Featherstone 1991:84). Cultural writer Virginia Postrel describes the 21st century as an “age of aesthetics”, when people are “demanding and creating an enticing, stimulating, diverse, and beautiful world” (Postrel 2004:4). The topic of everyday aesthetics is also emerging in contemporary philosophy, particularly emphasizing an increasingly blurred boundary between high art and mass culture. This blurring is visible in the aesthetization of mundane objects and the experiences of everyday life, such as when we prepare a meal (Duncum 2002; Dowling 2010). Those readings motivate a detailed and empirical study on the visual aesthetics in everyday objects, such as the ubiquitous mobile phone.

At the same time, there has been growing research on the relation between aesthetics and technology in the field of Human Computer Interaction (HCI). It is linked with general concerns to understand and influence the ways in which digital technology has a role to play in users’ “experience, emotion, desire, fulfillment” (Wright et al. 2008) and thus to extend the classic concern on increasing the usability in computing. Some of the recent studies (e.g. Quinn and Tran 2010) suggest that the boundary between aesthetics and usability is much less blurred than what has previously expected, since attractiveness plays a key role even in the usability ratings. Visual attractiveness is then not only about beauty on the surface, but also influences interaction and usability. Therefore, both the increasing interests of aesthetics in everyday life in social theory and HCI motivate us to explore the aestheticization of ubiquitous digital devices in our everyday life.

In this thesis, we are particularly interested in fashion, which is closely related to everyday aesthetics. Fashion is seen as playing an important role in shaping the ideas of what is beautiful and aesthetical. It has a long-term orientation toward aesthetics and beautification, which is unpacked and analyzed in fashion studies. There is a strong tradition in aesthetic theories that focuses on the individual internal state or experience of an appreciated object, such as perception and judgment of beauty, and the sensuous emotions as well as imagination. However, in fashion studies, fashion is widely seen as a “social” phenomenon. For example, it represents the ambiguity between individuality and social conformity (Wilson 2003; Simmel 1997); it can also refer to institutionalized arrangements and collective activities that turn clothing into the abstract fashion (Crane 2000; Kawamura 2005; Blaszczyk 2009). Moreover, fashion is featured by novelty and change in both the styles and the ideas of beauty (Kawmaura 2005; Wilson 2003). Compared to aesthetic theories that are looking for the balanced and the stable in beauty, fashion studies try to account for the constant changes and variations of beauty as well as the desire for new trends in fashion.

Despite of so many differences, contemporary academics on aesthetics and fashion do have one common trend, which is to study the everyday objects or experience. Fashion has had growing impacts on many domains in everyday life. In the 1990s, fashion writer Estelle Ellis who had rich experience in the industry gave a public speech on what fashion is at Fashion Institute of Technology in New York. She treats fashion as a causal agent that has constantly reshaped all material things, from the fabric that surrounds our bodies to the design of architecture (Blaszczyk 2009). More recently, fashion scholar Entwistle also emphasizes that fashion, as a system of stylistic innovation, is to be found in other domains as well, such as in architecture and product design (Entwistle 2009). So the objects in fashion studies extend from clothing items to a wider range of designed objects. Interestingly, this echoes the trend in contemporary aesthetic research, which tends to shift the attention to everyday objects and mundane experiences. In a way, the objects in fashion studies and aesthetic theories, which used to be very different, are now merging. This makes it possible to discuss both aesthetics and fashion in digital objects.

It is then no wonder that previous research on the beauty of digital devices tends to discuss how their usage is similar to fashion consumption. Here we focus on mobile phones, which have become one of the most significant gadgets close at hand in our everyday life. Its aesthetic aspects are gaining more importance for users, as seen in the research of mobile phones and fashion. Sociologist Leopoldina Fortunati unpacks the similarities between the consumption of mobile phones and that of ornaments as deriving from their shared location on our bodies (Fortunati 2005: 41). She argues that mobile phones are increasingly forming an integral part of an individual’s look that encloses the material nature of the body and the cultural modernity of fashion (Fortunati 2005: 37). In general, existing research on mobile fashion mainly focuses on mobile adoption as fashion consumption, both of which are ways to express identity and personality (Ling 2003; Katz and Sugiyama 2006; Kasesniemi and Rautiainen 2002).

However, recent institutional view of fashion in fashion studies tells us that fashion exists not only in consumption but also in production and diffusion (Kawamura 2005). There are only a few scattered studies concerning the production of mobile fashion. For instance, Shade (2007) observes the collaboration between mobile companies and fashion designers during the last decade, such as Siemens/Escada, Nokia/Versace etc. She mentions that strategies utilized in fashionalization mainly include co-branding of handset vendors with designers and handsets incorporating fashion elements (Shade 2007). Djelic and Ainamo (2005) focus on the institutional changes within mobile companies, which are influenced by fashion. They show that the mobile industry has been impacted and significantly transformed by the transposition of fashion logics, including symbolic production, mass customization and short commercial cycles. They touch upon related issues on fashion production, such as the employment of fashion logics to mobile industry, but their focus is rather the organizational changes within mobile companies, instead of the role of fashion in mobile design. So far, there is still a lack of the discussions on aesthetics/fashion in the design and production side of digital devices in the existing literature.

In sum, based on the theories of “aesthetization in everyday life”, the interests of aesthetics in HCI and the institutional fashion theory, we will explore in this thesis:

Question 1: *Whether there is aesthetization in the design of digital devices and how it occurs.*

We understand fashion mainly as institutional arrangements that turn an object into the ideal of fashion. Production of fashion is then very different from the manufacture of garments. Fashion’s connections to aesthetics and its unique features as well as the shared position of digital technology on our bodies with clothing items, drive us to explore the role of fashion in the design of digital devices as a way of studying the emergence of aesthetization in everyday life. Then our second and third questions will be:

Question 2: *How fashion in particular emerges from the design of digital devices.*

Question 3: Oncewe have sorted out the interplay between fashion institutions and the design of digital technology, we will further explore *how to design aesthetical digital technology to extend the influence of fashion institutions.*

Taken together, we aim to unpack the aesthetization in general and fashion in particular in the design of mobile technology and explore new design space for fashion and technology. In the following we discuss the methods and what we have gained through several studies.

## 1.1 Associative design approach

The three questions framed above will be addressed through a series of methods. Our study does not aim to provide augmented solutions to a well-defined problem, but to explore new design spaces that could benefit HCI research. We are influenced by the approach of “associative design” (Juhlin 2010; Esbjörnsson et al. 2004), which suggests that a design space is likely to emerge from combining and juxtaposing already established domains. According to this method, various studies, design and development activities are tightly associated and participants engage in all the parts to explore a design space.

We have conducted two types of research, which are associated together to explore the design space. The first type concerns empirical studies to investigate the social practices that have led to aesthetization and fashionalization in mobile design. These studies not only help understand the related social practices, but also provide us with design implications, such as proposing a design concept of “outfit-centric accessory”. The second type of research applies an approach of Research through Design (RtD). This method emphasizes developing design exemplars that could represent and instantiate design ideas, demonstrate research contributions, and generate new knowledge (Zimmerman et al. 2007; Gaver 2012; Frayling 1993). We have done two design explorations to investigate how to integrate institutionalized fashion values into design.

To conduct the two kinds of research, we have used a mixture of methods, including historical periodization, interviews and qualitative content analysis and building prototypes. They were selected based on their feasibility and the aims of the studies. This is influenced by the sociological research that encourages us to apply a mixture of methods as long as they are suitable to tackle the research question (Flick 2009). In all, combining various approaches and methods can explore the questions by touching upon a wide range of points, but we are also aware that it could never give a full picture of the area.

## 1.2 Unpacking aesthetization and fashion in the design of digital technology

This thesis focuses on how aesthetization in general (Q1) and fashionalization in particular (Q2) shape mobile design. Previous literature on “aesthetization of everyday life”, which mainly relies on general observations made by viewing products at a distance, “abounds with folk wisdom but lacks an empirical backing for its theoretical and common-sense view” (Tseëlon 2001: 436). They are important for inspiring new studies, but we need more extensive empirical indications and discussions of both how this trend emerges in particular domains and why it happens.

We mix qualitative methods with quantitative methods to do the empirical studies. Researchers in HCI have recognized the uneven employment of the methods in the studies on the topics related to hedonic and argue that to study the concepts that are built on experiential value and the subjective facets of HCI, new methods are needed (Diefenbach et al. 2014). This drives us to apply a mixture of methods in order to study aesthetics, which are not only built on experiential values, but also deeply integrated in social practices. We apply different methods to investigate different questions.

First, we have done a periodization of changing styles of Nokia phones to investigate the connections between aesthetics and mobile design. In order to unpack the broader trends, which might not be visible in the design of individual devices, we conduct a periodization, which can facilitate our understanding of a particular history by breaking it into smaller units, by focusing on specific time spans, and by promoting easier recall (Hollander et al. 2005). We focus on the phones designed by Nokia, since the company has been one of the biggest producers in mobile history and a pioneer in making mobile phones stylish (Djelic and Ainamo 2005). “Aesthetization” is vaguely defined by Featherstone, while Postrel (2004) argues for a slightly more elaborated concept of “stylization” as increased visual variation. Such an approach is also suggested in the design research of interior decoration and cars (e.g. Eskilson 2002). Understanding aesthetization as increased variation allows us to conduct a qualitative content analysis in order to make the periodization. We do close visual inspection of photos to reveal the visual expression of each model and then use a qualitative approach to group the releases into more generalized categories. The statistics of the phone releases each year between 1992 and 2013 are visualized into a diagram (Figure 4-1).

This study provides us with rich empirical materials on the visual trends of Nokia phones. Identification of the amount of visual forms hints at the interests in the aesthetization of mobile design. Such interests varied a lot. We have identified four periods: the Candy-bar period, the Color period, the Grand period and the Slate period. Among them, the Grand period stands out in terms of visual aesthetics, which sees a large variety of forms and an increased integration between fashion and mobile design.

In order to understand why there were such changes, especially why the Grand period emerged, we interviewed some key persons from the company. The interviews indicate that first, the orientation toward visual aesthetics was initiated in the hope of making the product more personalized and being able to segment the market; second, the increased aesthetization of mobile phones in the period were influenced by an orientation toward fashion institutions. By providing more exclusive and experimental visual features, Nokia attempted to appeal to fashion conscious consumers. The results also show that the demise of visual variations mostly results from the rapid development of touchscreen technology in mobile design.

Then we further investigate the emergence of fashion in mobile design. To do this, we firstly need to clarify how we understand fashion and design. Fashion is a wide concept that contains a variety of perspectives, so is the term of “design”. According to fashion studies and aesthetic theories, fashion differs from aesthetics mainly in that fashion is rather a social phenomenon that is collectively constructed and shaped by various social relations. Drawn from sociologist Kawamura’s theory of fashion-ology, we treat fashion as institutional arrangements that involve a lot of individuals and organizations and turn clothing into the ideas of fashion (Kawamura 2005). As to design, it could refer to all kinds of human shaping that make something to satisfy human’s needs (Heskett 2005), then it includes a wide spectrum of categories, such as interior, product, fashion, architecture and system design. If we understand design in a narrower way, i.e. a type of thinking or institutional work, then we can compare it with the institutional view of fashion. Design thinking is claimed to focus on problem solving (Martin 2009), while fashion thinking emphasizes aesthetics, creativity and change (Nixon and Blakley 2012). It is then possible to examine fashion in the design of mobile phones to see how it influences the aesthetical aspects of them. More importantly, fashion thinking is nested into a set of institutional arrangements done by relatively stable organizations. Therefore, from the institutional perspective, to investigate how fashion emerges in the mobile design means to examine whether important fashion institutions are influencing mobile design. Here institution means laws, rules and conventions that could guide human behavior in social life (Scott 2004). Shared institutions are likely to be where fashion emerges, since they are able to turn mobile phones, instead of clothing, into fashion through institutional arrangements that are established in the fashion system.

Based on our interviews with key actors in both the fashion industry and the mobile industry, we find that there are shared institutions between the two industries, such as trend research. These institutions are embedded into the concrete activities in mobile design that actually lead to the generation of mobile fashion. The concrete interactions between mobile design and clothing fashion reveal an ongoing engagement with fashion in mobile design. However, these influences follow complicated patterns, which seem to be different from what Kawamura has discussed about the fashion system. Her fashion-ology orients to a structural-functional view of fashion institution, treating agencies and organizations to be salient parts within a whole system. However, our empirical materials show that the shared institutions tend to be socially constructed. This points to another perspective in organization theories, constructivism, which understands reality as socially constructed and contextually dependent (Berger and Luckmann 1991:15). Constructionist view understands organizations as heterogeneous and fluid things that are constantly being made and in which multiple actors face new types of challenges. In particular, we are interested in Czarniawska’s action net theory, which aims to illuminate how collective actions are tested, repeated, or dropped in a process where actors make “connections” that either dissolve or are stabilized (Czarniawska 2008). Our study shows that fashion in mobile phone design is formed through “action nets”, i.e. loose connections generated from repeated actions into which words, images, or ideas can be translated. The action net of mobile fashion co-exists with other action nets, which make fashion in mobile design less explicit than in clothing fashion.

The two studies reveal that mobile design piggybacks on the fashion industry through concrete activities, such as shared institutions. Then we turn to fashion diffusion to further investigate mobile fashion. We have done a qualitative content analysis of mobile phones in online fashion media to see how mobile phones are institutionalized into fashion items from the perspective of fashion insiders. Online fashion media not only is one of the important gatekeeping mechanisms in fashion diffusion, but also provides available empirical materials for aesthetic experience in fashion practices. We find a limited number of posts on mobile devices in the empirical materials, which may mean that something is missing in mobile design. Through studying the limited materials, we propose a concept of “outfit-centric accessory” and discuss how this could influence the design of fashionable digital devices. It emphasizes the following features in the visual beauty of accessories:

* Visual beauty that is publicly available
* Visual beauty that matches the ensemble/outfit
* Visual beauty that adapts to the variation of the outfits

These features reflect the common understanding of accessory in the fashion system, which could be seen as institutionalized values. Thus, if we design digital devices to account for these values, the technology would be likely to gain more interests among fashion conscious consumers.

Through our empirical studies, we attempt to demonstrate that fashion emerges from the concrete interactions in mobile design, which refer to the shared institutions with the fashion industry. The interactions are best understood as flexible and dynamic action nets of institutional arrangements that can be selectively used and integrated to make digital devices fashionable. We propose a term of “Tech Fashion” to account for these considerations in order to design fashionable digital devices.

## 1.3 Designing for “Tech Fashion”

To investigate our third question *how to design digital devices that extend the impacts of fashion*, we take a Research through Design approach (Zimmerman et al. 2007; Gaver 2012). The goal of this approach is to generate design implications through a concrete design exemplar, rather than offer a solution to an existing problem. It emphasizes the designed artifact as an outcome in which the knowledge generated is also embedded (Zimmerman et al. 2007). The knowledge intends to be “generative and suggestive” rather than provide generalization through falsification (Gaver 2012). In the second part of the thesis, we explore the new design space through developing two concrete design exemplars.

Our design work is interdisciplinary from the start. The design process in each case combines the knowledge of related research, theories from various domains that are inspiring, fieldwork and consideration of technical conditions, which orients to an associative design approach developed by Juhlin (2010). Such an approach suggests that different research and design activities are tightly associated to explore new design spaces. In specific, we combine three types of studies.

First, we use fieldwork as a source of design implication. We particularly highlight studying social practices to generate knowledge that could be sources of design implications. This is neither to identify problems through giving the participants tasks nor to result in detailed design requirements, but to observe and better understand an activity that is relevant to the topic, in this case, matching clothes and accessories in dressing practices. The case of shape-switching device focuses on the clothes matching practices; while the “Watch for Figuracy” on the watch matching practices.

Second, instantiation is applied as a concrete exemplar of design implication. This is the core of the RtD method. The instantiations take the form of possible design concepts embodying an abstract property or feature. Their main aim is to support the understanding of the related abstraction. Our design explorations result in two types of design exemplars: one is low-fidelity prototype, an imagined “shape-switching” device, which is represented by a series of mock-ups; the other is relatively high-fidelity experimental prototype, a functional smart watch application “Watch for Figuracy”. Both of them provide instantiations for designing public visual aesthetics that match an outfit and can vary according to the changes of outfits. The former is to explore new hardware inspired by emerging technology, such as organic interfaces; the latter is to explore how to design a combination of hardware and software.

Third, user study is conducted as empirical validity of design implication.

Our user studies aim to see how the potential users might interact with new designs to generate desirable experience and support social practices, instead of testing how well the design could function. Thus we use qualitative interviews instead of quantitative measurement to get early feedback for the two design exemplars. We explore how the participants would use the designs in their matching practices. In both cases, the potential users have created many outfits or ensembles, which integrate the design exemplars (Appendix 1 and 2).

In sum, this thesis provides two concrete instantiations, which demonstrate that we can create something innovative and interesting based on the learning from the new design space of mobile technology and institutional fashion. Designing fashionable technology should not just refer to accessorize a device with beautiful shells or embed sensors into a piece of fabric, but ought to consider a complex eco-system of fashion, including its rules, institutions and values.

## 1.4 Contributions

This thesis investigates how aesthetization in general and fashion in particular occur in the design of digital technology and how we could design digital technology to account for the extended influences of fashion. First, it complements the increasing discussions of aesthetics in the field of human computer interaction. HCI researchers have recognized that it is no longer enough to merely focus on the usability and functionality of new technology; instead, there should be a more holistic understanding of the user experiences, which consists of both functionality and aesthetical aspects. Aesthetics are seen as playing an important role in fulfilling the demands of emotion, desire, fulfillment that users have in using technology. While we celebrate the expansion of the vision in HCI, we should also be aware that it is more complex to discuss aesthetics in everyday technology than simply borrowing notions from the aesthetic philosophy that HCI researchers find relevant to their topics. The pragmatist aesthetic theory has been very influential in HCI, probably because some of the arguments from this theory fit well with the vision of HCI. However, in aesthetic theories, the pragmatist approach has been criticized and caused many debates. Furthermore, our empirical studies show that the features of aesthetic experience listed by John Dewey seem to be unfit with some aesthetic experience, such as that in the fashion practices. Therefore, we argue that more attentions be paid to studying social practices to generate design implications, which will complement to the inspirations generated from philosophical thinking.

Second, this thesis contributes to better understanding the role of aesthetics and fashion in the design of digital technology. We understand beauty and fashion as emerging from the social relations and cultural contexts, which we term the “relational” view. This is generally lacking in the studies of related topics in HCI. We here propose a term of “Tech Fashion” to account for an institutional view of fashion in the design of digital technology. This suggests that the interactions that produce fashion in the technology design should be understood as dynamic action nets. The flexible integration of institutionalized fashion values turns digital devices into fashionable items in the design process.

Third, the two design cases demonstrate in concrete ways how the new design space could contribute to practice-based designs. Designing fashionable technology does not mean making beautiful shells, attaching ornaments or making computers in the form of clothing items, as what the industry has tried, but should consider fashion thinking and institutions. Our design explorations show both opportunities and challenges in such design. There should be more extensive collaboration between fashion design and interaction design.

# 2 Theoretical Background

This thesis aims to investigate the role of aesthetics in general and fashion in particular in the design of digital technology. It is necessary to examine the theories on related topics before we further investigate the research questions. This chapter then deals with the existing research in both topics, with aesthetic theories as the first section; fashion studies as the second section. For each section, we start with presenting the main approaches or views of aesthetics/fashion and end up with discussions of the studies on the two topics in HCI literature. In the following we will present the various approaches and views in those related topics.

## 2.1 Aesthetic theories

Aesthetics is generally concerned with grounding or philosophically legitimating, judgments about art and beauty (Dickie 1997; Bardzell 2009). It asks questions like what is the essence of beauty? When is beauty generated? Why do we see something as beautiful? How do we perceive beauty? Although art is not the same as beauty, it is perhaps the most important subject of study in aesthetic theories, and especially in classical studies. Art theory is here considered as a sub-discipline within aesthetics. This section presents important approaches to study beauty and the main approaches of studying aesthetics within HCI. Based on different epistemological thinking, we summarize three views on it: beauty in the objects, which refers to beauty in the visual form and expression of the objects; beauty in the minds, which treats beauty as something abstract constructed in our minds, no matter whether it is sensuous feelings or intellectual judgments; and beauty in relations, which defines it as emerging out of social relations. Those different views of aesthetics are presented in the first three sub-sections. In each of them, we will introduce relevant arguments of key philosophers and sociologists. The fourth sub-section concerns the research on aesthetics in the field of HCI.

### 2.1.1 Beauty in the objects

Some philosophers argue that beauty emerges out of the reasons or logics of the form of objects. This means that we judge things to be beautiful by finding out the principles and concepts in the form or expression of an object. These philosophers tend to have an objective view of beauty, which treat beauty as existing in the form of objects and outside of human’s mind. They argue for universal rules in beauty. In this sense, human’s perception of beauty is passive, since we perceive something beautiful when an object presents its beauty in the visual form through a set of universal principles, such as order, harmony and perfection.

This sort of thinking could be traced back to ancient Greek philosophy. Greek philosophers were generally considered to be the earliest source of aesthetic discussions in western thinking. Plato claims that that an object is beautiful is by virtue of its participation in the abstract “Form of Beauty”, which transcends the world of sense (Dickie 1997: 7). He believes that beautiful objects incorporated proportion, harmony, and unity among their parts. Similarly, Aristotle argues that the universal elements of beauty were order, symmetry, and definiteness (ibid).

The most representative philosophers that have such an argument are German rationalists in the 18th century. For example, Christian Wolff defines beauty as the perfection of an object: “Beauty consists in the perfection of a thing, insofar as it is suitable for producing pleasure in us” (Wolff 1968: 420). Perfection is a crucial concept in his theory, which means “harmony” or “concordance” of a manifold or multiplicity of objects or parts of objects (Wolff 1962: 390). Another key figure in proposing universal rational principles in beauty is Alexander G. Baumgarten, who was the initiator of “aesthetics” as a branch of philosophy. According to him, beauty has much to do with the expressions in the form of objects that show rational logics. The order and expressions in the appearance of objects represents “the harmony of the thoughts” (Baumgarten 1750: 8). Perfection is conceivable in the harmony of the order and in the internal consensus of the order with itself and in its consensus with the things (ibid: 9).

In all, such a view emphasizes the objectivity of beauty in the physical form of an object.

### 2.1.2 Beauty in the mind

Contrary to the previous view that focuses on the objective beauty in material forms, other philosophers argue that aesthetics emerge in the internal mind of human being through sensory experiences, as what empiricist philosopher Hume claims. Then, “beauty and deformity, are not qualities in objects, but belong entirely to the sentiment” ( (Hume 1870)139). There are several focuses within the internal perspective of beauty.

First, beauty is argued to exist in our imagination. For instance, Joseph Addison argues that beauty is in the imagination of human being and the pleasure of taste is the pleasure of imagination. There are two types of pleasures of the imagination: the first is the “primary pleasures of the imagination”, which are generated when we are looking at some physical objects; then there is “secondary pleasures of the imagination”, which flow from the ideas of some objects, when the objects are not actually in front of us, but are called up into our memories (Addison and Steele 1879: 122-3). In addition, Archibald Alison discusses the “association” as a way to evoke imagination. He argues that any part of the material world is able to become beautiful when it is associated with a certain quality of mind, which evokes “the emotion of taste”. An emotion produces a thought, which is typically represented by an image in the imagination. The first thought leads to a second thought, and then a third; thus a whole unified train of images is formulated by the association of ideas (Alison 1811). Therefore, the association of ideas plays a role both in the construction of “the emotion of taste” and supplying the basis for the expressiveness of the material world (Dickie 1997: 19). Many modern aestheticians who specialize in art theory treat the beauty of art as in the imagination, such as R. G. Collingwood (1938) who sees art as expressionist imagination.

Second, beauty emerges from sensuous feelings and emotions. For instance, Francis Hutcheson argues that aesthetic perception is not a form of cognition or knowing something, but rather sensuous feelings. According to him, humans have a “sense” in perceiving beauty, which refers to a power that enables pleasure to “strike us at first with the idea of beauty” instead of a pleasure arisen from “any knowledge of Principles, Proportions, Causes, or the Usefulness of the Object” (Hutcheson 1726/2004, 25). Then the ideas of beauty will grant us immediate pleasure. Thus beauty is rather connected to sensuous feelings than rationality or instrumentality.

There is a strong focus on the feelings arisen from sight in classic aesthetic theories. Traditional objects of aesthetic theories are artworks such as paintings, sculpture, and nature such as mountains and sunset, both of which are visually presented to us. For instance, Joseph Addison emphasizes the sense of sight, as he states that the pleasures of the imagination “arise originally from sight” (Addison and Steele 1879: 30).

However, in recent years, a few philosophers attempt to propose a turn from the focus on the sense of sight to other senses. The most representative philosopher with such a view is Richard Shusterman, who emphasizes aesthetic feelings emerging out of bodily interaction. He particularly emphasizes the body as “a locus sensory-aesthetic appreciation (aisthesis) and creative self-fashioning [...], devoted to the knowledge, discourses and disciplines that structure such somatic care or can improve it” (Shusterman 2000: 267). Inherent from Dewey’s pragmatist aesthetics, he further proposes that bodily and mental (as well as cultural and biological) dimensions of human beings are essentially inseparable. To emphasize this unity, he uses the term “soma” which, unlike “body”, does not automatically connote passive flesh contrasted to dynamic soul or mind (Shusterman 2000).

Third, beauty is considered to be a concept generating from intellectual thinking or judgment. Immanuel Kant is perhaps the most representative philosopher that contributes to the discussions of aesthetic judgment. He agrees that beauty exists in the human mind. However, he does not believe that aesthetics is always subjective and completely sensuous. Instead, he treats aesthetics as “reflective judgment”, which means that the appreciation of beauty involves intellectual thinking, such as seeking a new concept. Thus, aesthetics is rather mental acts that “bring a sensible particular under some universal” (Kant and Meredith 1988). To illustrate the “universal” in aesthetic judgment, he particularly develops two concepts, which are “disinterested” and “universal”. As one of Kant’s most influential concepts on aesthetics, “disinterested” refers to a non-instrumental or purposeless judgment on aesthetic objects. “Universal” then refers to the key feature of the faculty of taste. That such a faculty is universal is shown through the fact that aesthetic judgment always leads us to expect others to agree with us. It is our faculty of judgment that enables us to have the experience of beauty and to grasp those experiences as part of an ordered, natural world with purpose. Kant insists that universality is the product of features of the human mind and that there is no objective property of a thing that makes it beautiful.

In sum, the view of “beauty in the mind” argues that aesthetics emerge in the internal mind of human being, such as in the imagination, sensuous feelings or intellectual judgment.

### 2.1.3 Beauty in relations

There is another perspective that treats beauty as generating from social relations. This is typically visible in art theory. It looks into the social and cultural conditions that shape and produce art, instead of what is going on in our mind as most philosophers do. The focus here is the socially shared and collectively organized practices that underpin aesthetic judgment. Then aesthetic judgment is invoked to endow performances and products with value (Atkinsen 2009: 70). There are basically two approaches to examine the relations where beauty exists.

First, some sociologists emphasize the economical and social structures that determine our taste. For instance, sociologist Karl Marx believes that economic and social conditions, and the class relations that derive from them, have strong impacts on every aspect of an individual’s life. It goes from religious beliefs to cultural frameworks, including aesthetics (Marx 1978). This view highlights that an individual’s sense of beauty is dependent on the economical, political and social structures of a society. Marxist aesthetics have influenced many contemporary philosophers and sociologists, such as Theodor W. Adorno, Walter Benjamin, Georg Lukács and Raymond Williams. Although aesthetics is only part of their writings, they generally share with Marx the arguments on social aesthetics. For example, Adorno emphasizes that art is embedded in society as a whole and argues that modern art is “the social antithesis of society”(Adorno and Kentor 2002: 8). The artwork has an internal truth content, which is historical and firmly tied to specific societal conditions. Benjamin highlights the political functions of art. In his famous work “The Work of Art in the Age of Mechanical Reproduction (or Reproducibility)” (Benjamin 1968), which is representative for Marxist aesthetic theory, Benjamin intends to construct a theory of art that would be “useful for the formulation of revolutionary demands in the politics of art”. He argues that previously art is invented to serve the needs of distributing the traditional and ritualistic values. As those values vanish in the age of mechanical reproduction, modern art, such as films and photography, which he focuses on in this work, would inherently be built on the practice of politics, as he writes:

Mankind, which in Homer’s time was an object of contemplation for the Olympian gods, is now one for itself. Its self-alienation has reached such a degree that it can experience its own destruction as aesthetic pleasure of the first order. This is the situation of politics, which Fascism is rendering aesthetic. Communism responds by politicizing art”(Benjamin 1968:242).

Thus modern art becomes a weapon for politics. That said, beauty emerges from a power relationship in a society.

Moreover, as one of the most influential sociologists who write on taste, Pierre Bourdieu investigates why people have differences on individual taste through extensive empirical studies. He proposes that it is mostly due to the different cultural capitals they own. Cultural capital is a significant notion in his theory, which means non-financial social assets that can promote social mobility beyond economic means, such as education (Bourdieu 1984). Those who have a high volume of cultural capital are most likely to be able to determine what constitutes taste within society, while those with lower volumes of overall capital accept this taste. In this way, the distinction between high and low culture is created legitimately and naturally. Taste functions “as a sort of social orientation”, guiding people in certain social space towards the social positions adjusted to their properties (Bourdieu 1984: 466). Thus, taste is an important example of how class fractions are determined by the possession of social, economic and cultural capital.

The second view sees beauty and art as produced in social activities where many actors are involved, such as in institutionalization. This is particularly visible in contemporary art theory. For instance, philosopher George Dickie (1974) suggests that the sociological institutions of the art world were the glue binding art and sensibility into unities. He argues that a work of art is on the one hand, an artifact; on the other hand, it is also a set of aspects of which has had conferred upon it the status of candidate for appreciation by some person acting on behalf of a certain social institution within the art world (Dickie 1974). The central notions in the making of art are “inflected, that is, they bend in one, presuppose, and support one another” (Dickie 1997: 92). Howard Becker’s *Art Worlds* (1982*)* is a classic work that proposes a systematic sociology of art. He demystifies art as expression of genius artist and instead, argues that art is socially constructed by various individuals and organizations, such as a network of suppliers of materials, distributors of art works, fellow artists, critics, and audiences. Artist and curator Nicolas Bourriaud proposes a term of “relational aesthetics” to illustrate “a set of artistic practices which take as their theoretical and practical point of departure the whole of human relations and their social context, rather than an independent and private space”(Bourriaud 2002: 113).

In addition, it deserves mentioning that pragmatist aesthetic theory emphasizes aesthetics’ emerging from the interactions between human beings and the “environment”, or the world in which he lives (Dewey 2005). For instance, Dewey states, “the career and destiny of a living being are bound up with its interchanges with its environment, not externally but in the most intimate way” (Dewey 2005:12). The environment can be interpreted in many ways, such as the social-historical dimension of our appreciation of art, which is in line with Marxist aesthetics; or arts as “an integral part of the ethos and institutions of the community”(Dewey 2005: 13-14), which reflects the view of beauty as in social and collective activities.

In all, beauty in social relations has been a crucial topic in modern sociology. The first approach for such a topic suggests that aesthetic judgments are determined by the economic and social structures and there is a commodification of beauty in the capitalist society. A second view focuses on the social activities that lead to the generation of art and beauty.

### 2.1.4. Aesthetics in human computer interaction (HCI)

Research in HCI has paid increasing attentions to the role of aesthetics in understanding and designing for our interaction with technology. Aesthetics is applied to understand the “non-quantifiable, subjective and affect-based experience” of interactive technology rather than usability (Tractinsky 2000: 128). In the following we give an overview of its main approaches to study aesthetics in HCI.

#### Beauty in the objects

Aesthetics is seen as the quality of beauty in the objects (Hallnäs and Redström 2002; Lim et al. 2007). For instance, Sonderegger et al. (2014) argue that the term aesthetics is used to refer to “the objective exterior properties of the product”. Hallnäs and Redström (2002) then argue that the exterior properties of products are beautiful if they emerge out of the inner logics of the physical features. They argue that there should be a focus on aesthetics to understand the ways in which we live with technology, rather than just use it as a tool with specific functions. They understand “aesthetics” as “logic of expressional”, which is concerned with how material builds expressive things. They argue:

Good design from an aesthetical point of view basically is a logical question, not primarily a question of psychology, ethnography, sociology, etc. It is a basic axiom here that it is through the force of its inner logic, its consistent appearance that a thing receives depth in its expression and thus its strength to act as a placeholder for meaning. Behind each expressive thing present in our lives there is an expressional with a strong form. (ibid: 116)

Thus the form of the expressive object represents the inner logics and acts as a placeholder for meanings. This can be seen as a normative approach, which defines particular descriptive attributes of the product as expressing inherent “beauty” (Hallnäs and Redström 2002; Ngo and Byrne 2001), such as symmetry or proportion. This approach starts from the materials and results in rules that provide a guide of how to design something attractive. It departs from the idea that design styles are objectively “out there”, in that their identification is independent of the people providing design preferences and their social background. Then the focus of interest is on the appearance of a design.

Apart from design, aesthetics is also discussed in computer science. For instance, the term of “computational aesthetics” was generated in 2005, aiming to revisit the biased view of “aesthetic pollution” as a side effect of computer aided design and motivates to improve computational methods by adding aesthetic awareness (Hoenig 2005). This concept treats beauty as the inner logic or mathematical principle in the form and design of a system that could be computational and measured. This has much influenced the area of Graphics, Visualization and Imaging within computer science.

#### Beauty in the mind

Aesthetics is also understood as perceptions of beauty in the minds in HCI. There are different focuses within this perspective. First, beauty is derived from or treated as sensuous emotions. HCI researchers recognize that aesthetics plays an important role in fulfilling users’ emotional demands, such as “experience, emotion, desire, and fulfillment”(Wright et al. 2008). They highlight sensuous emotions as a key feature to identify “engaged” and “aesthetic” experience, such as satisfying, enchanting, disappointing, or frustrating. This focus is in line with the strong psychological tradition within HCI research. For instance, as early as the 1980s, Donald Norman’s works on emotional design, such as *The Design of Everyday Things (2014)* and *Emotional Design (2004),* became very influential in interaction design and HCI in general. With the view of seeing beauty in sensuous emotions, the aim of interaction design for aesthetics becomes designing for emotional feelings, pleasure and attraction, assuming that users “wanna have fun” (Wright et al. 2008). The researchers also suggest an empathetic understanding of materials as well as users in design.

Moreover, some HCI researchers underscore the senses that generate emotions. This is particularly visible in the concept of “aesthetic interaction”, which is influenced by pragmatist aesthetic theory. This theory, as represented by John Dewey’s work, emphasizes that beauty emerges from all balanced senses. This motivates HCI researchers to examine other senses than visual, especially touch. Petersen et al. (2004) extend the recognition of the value of beauty to our engagement with technology and suggest that aesthetic interaction should not only concern immediate visual appear­ance, but also include the interaction per se. They argue that focusing on visual appearance is “leaving out much of the potential of aesthetics” (ibid: 270), which leads to a focus on bodily movements and haptic. In recent years, some HCI researchers follow Shusterman’s “somaesthetics”, which particularly focuses on the attunement of the body-mind or soma (Shusterman 2000). This concept treats aesthetics as something vividly felt and subjectively savored, affectively absorbing us and focusing our attention on its immediate presence. Its impacts on HCI can be found in practical applications, such as physically engaging mobile services and artworks that trigger reflection on bodily movements and physiological status (Fagerberg et al. 2004; Schiphorst 2009).

Second, some researchers argue that beauty particularly exists in the holistic and complete experiences where sensuous emotions and intellectual thinking are united (Löwgren 2009; Wright et al, 2008; Norman 2004). Beauty in the experience is rooted “in the way in which this object is meaningful and transforms the perceiver’s understanding, making enjoyment so much deeper” (Fiore et al. 2005: 130). Wright and McCarthy (2008) see aesthetic experience with technology as being founded in the interplay between language, sensation, and emotion, and constituted by the processes of sense making. Petersen et al. (2004) argue that an aesthetic experience of an interactive system is comprised of both a bodily sensation and an intellectual challenge. This view derives from the pragmatist aesthetic philosophy, which is represented by the philosophy of John Dewey. Pragmatist aesthetics suggests that aesthetical experience is a unified whole, since it is not only in the emotional feelings, but also includes intellectual thinking, such as sense making. Each part relates to the total action in a meaningful way and is felt by the experiencer to have a unity or a wholeness that is fulfilling (Dewey 2005: 58). During the meaning making process, the parts come together to give a sense of culmination or consummation that gives unity to the whole (ibid: 5).

Third, beauty is also considered as judgment made by the users. This perspective is empirically concerned with what users judge to be beautiful (Hassenzahl 2004; Tractinsky 1997). What is important is the judgment and perception of “beauty”, instead of the qualities in the objects, despite that the judgment is sometimes closely connected to the objects. There is a large amount of empirical research on aesthetic judgments and preferences (e.g. Lavie and Tractinsky 2004; Roberts et al. 2003; Tractinsky et al. 2000). In general, those studies contribute to a better understanding of people’ overall impression or general user satisfaction on designed artifacts. Moreover, some studies with this view also address the question of how people judge beauty in relation to other product attributes, like usability. It is argued that the boundary between aesthetics and usability is much less blurred than previously expected, since attractiveness plays a key role in the usability ratings (Quinn and Tran 2010; Sonderegger et al. 2014). But it does not simply mean that attractiveness always has a positive effect on what people perceive as useful. For example, Angeli et al. show that the link between aesthetics and usability is more complex than the strong claim of “what is usable is beautiful”. The view of beauty as judgment takes a psychological stance. It suggests cognition as the foundation of interaction and sees the designer as an analyst aiming to meet objectively identifiable requirements in design. It mainly applies quantitative measurement in usability evaluation, which has been the main method to study the hedonic aspects in HCI (Diefenbach et al. 2014).

In all, the view of “beauty in the mind” plays a significant role in the research on aesthetics in HCI. Although these studies agree that beauty exists in the mind of human beings, there are differences among detailed viewpoints. Beauty is understood as sensuous emotions, the aesthetic feelings of bodily interaction, a holistic unity of sensuous feelings and sense-making, or aesthetic judgment and preferences.

#### Beauty in relations

There is another approach that treats beauty as something existing neither in the objects nor in the mind of users, but in the social relations where we interact with others in specific contexts. Some researchers in HCI suggest that aesthetics is not something a priori in the world, but a potential that is released in dialogue in which self, others, and technology are constructed as multiple centers of value (Dewey 2005; Wright et al. 2008). It is based on valuable use relations influencing the construction of our everyday life. Similar to some of the viewpoints in previous section, the view of beauty in the dialogue among users, technology and the world is also influenced by pragmatist aesthetics, which argue that aesthetic experience should account for the “environment” in which it occurs (Dewey 2005: 12). It provides a new way of seeing experience with technology, a “felt” experience that is “creative, open, and relational” (McCarthy and Wright 2007). Such an approach to the aesthetics of interactive systems also implies that aesthetics is tightly connected to context, use and instrumentality; circumscribing our perspective on aesthetics. According to this view, it becomes meaningless to think of aesthetics of artifacts in themselves. They might contain an aesthetic potential, but its release is dependent on context and use. This view of aesthetics in the digital technology emphasizes the individual user’s ability to interpret and explore the system in certain context, which could create a frame for allowing the users to express themselves through the interaction.

In addition, a few studies focus on the social and institutional shaping of aesthetics. For example, in their empirical study of craftsmen in the US and Taiwan, Bardzell et al. (2012) aim to enrich the design research community’s notions of quality by turning to the techniques and values of master craftspeople. They find the understandings of quality as attributes and craftsmanship are mutually constituted as an ongoing social accomplishment. They also discuss the role of policies that plays in the development of craft, i.e. how they impact the individual and the community.

Many more studies have a holistic understanding of the aesthetic experience and thereby social aspects become one dimension of such experiences. For instance, psychologist Marc Hassenzahl (2003) proposes a complex model in which “varying situations” is one of the key elements of user experience. Angeli et al.’s (2006) work on the assessment of aesthetics and usability argue that the judgments of aesthetics and engaging designs are highly contextually dependent, i.e. when the context is less serious, aesthetics can have a strong halo effect; however, this may not generalize other more serious user/application contexts. Those studies consider social contexts as one dimension for aesthetic experience.

Until now, we have presented various views of understanding beauty in aesthetic theories and HCI. The connections between the approaches in the two fields are rather obvious.

Both aesthetic theories and the studies on aesthetics in HCI share the three approaches of understanding beauty, i.e. 1) beauty in the objects, 2) in the mind or 3) through relations. In particular, the first approach on aesthetics in HCI seeks universal principles of beauty in the visual form of designed objects and tends to separate beauty from the cultural and social contexts. This is in line with the Greek aesthetic theory and German rationalist aesthetics. The second approach concerns beauty in the mind in general. With this view, beauty is considered to emerge out of sensuous emotions, reflecting Hume and Hutcheson’s arguments on aesthetics. Beauty can be derived from a holistic unity of emotions and sense making, which is shared with the views from pragmatist aesthetic theory represented by John Dewey. Beauty can exist in judgment, which echoes Kant’s theory. Beauty can emerge out of relations, such as the interactions among people, technology and the world, which is again influenced by the pragmatist aesthetic theory.

Existing research of studying aesthetics in HCI has touched upon many important points derived from aesthetic theories. Although theoretical discussions on such topics are relatively few, there are a large amount of empirical studies on aesthetics in HCI, which orient to the analytical or psychological views of beauty in the mind. Researchers in HCI have already called for a need of rethinking aesthetics beyond this view (Fiore et al. 2005). Instead, they propose a pragmatist view, which “supports a more artistically oriented idea about design, more able to account for the roles of emotion, engagement, the separation between objects-subjects and events unfolding unplanned as a normal feature of the instability of existence”(ibid: 129). The pragmatist aesthetics, especially John Dewey’s theory, has become influential in the field. In seeking an alternative way to explore how to meet human needs and desires when engaging with interactive systems, the pragmatist aesthetic theory has been used as an approach to deviate from the dominant psychological perspective of aesthetics. On the one hand, we recognize the contribution that pragmatist aesthetic theory has brought to this field, such as bringing the views of everyday aesthetic experience as well as the social and contextual of the experiences. On the other hand, the Platonic features of this philosophy e.g. an experience that is harmonious, all senses balanced, complete and unified, also make us doubt how far we could get if we continue using this theory in the design oriented research.

Meanwhile, we are also aware that there are a lot of theories on aesthetics that focus on social relations where beauty emerges from various perspectives. Unlike philosophers that rely on philosophical reasoning to make their arguments, sociologists observe what is going on between people and society in the world. A sociological aesthetics, i.e. beauty in relations, focus on the social, cultural or institutional production of beauty. However, this perspective is still lacking in the studies of aesthetics in HCI, which might bring in new blood to related discussions. Here we call for a more profound understanding of aesthetics in HCI and HCI researchers should not be constrained by one theory.

### 2.1.5 Conclusion

This section presents the three major approaches to study beauty in aesthetic theories and how HCI researchers approach aesthetics and beauty, as the following table summarizes. If beauty is seen as an objective attribute in an object as the rationalist view suggests, the task of creating beauty for a designer in HCI is to find out the universal principles in the physical expression of that object and attempt to realize it in the design. If beauty is the judgment and responses in the mind arisen from the sensuous experiences of objects, then the task becomes to design an object that has the potential to provide aesthetical appraisals in the minds of the encounters. What values in an object could evoke aesthetic feelings has been mainly studied through cognitive psychological methods. If beauty exists in social relations, it emphasizes that beauty is contextualized to relate to other individuals or institu-

Table 1 An overview of aesthetic theories and aesthetics in HCI

|  |  |  |  |
| --- | --- | --- | --- |
| Beauty | Aesthetic theories | Key philosophers | Aesthetics in HCI |
| In the objects | Harmony and perfection in the form; | Greek philosopher:  Plato; Aristotle  German rationalists: Christian Wolff; Alexander G. Baumgarten | Inner logic of expression in the form of objects  Design studies/ computational aesthetics |
| In the mind | Imagination | Joseph Addison  Archibald Alison |  |
| Sensuous feelings; emotions | Francis Hutcheson  Joseph Addison | Emotions;  Sensuous feelings; bodily interaction |
| Intellectual thinking and judgment | Immanuel Kant | Sensuous plus intellectual thinking/sense-making |
| In relations | Economic and social structures that shape taste | Karl Marx; Marxis aesthetic theorists  Pierre Bourdieu | In a dialogue among self, others, technology and the world;  Context/ Pragmatist aesthetics’ “environment”;  Situation as a dimension in a holistic experience |
| Social activities or institutions produce art and beauty | George Dickie  Howard Becker |

-tions, rather than being generated by organs and neurons. Then the task of creating beauty is to take into account the various relations and use them to build beauty ideals. As far as we see, the relation view of beauty has been underestimated in the research on aesthetics in HCI. In this thesis, we use a combinational understanding of beauty to explore the aesthetics of digital technology. Similar to the view of “beauty in the objects”, we attend to the visual forms of digital artifacts, which we could see and which could be seen as the candidate for aesthetic appreciations and appraisals. However, we do not see visual beauty as emerging from the inner logic of a form, but rather from the complex interactions with the environment and contexts, as the relation view of beauty suggests. In this light, the visual form of beauty would vary in-between different objects and present in diversified ways, since it is socially constructed by various actors and institutions.

## 2.2 Fashion studies

Fashion studies are an area that has a strong focus on aesthetics. As fashion theorist Elizabeth Wilson puts it, fashion is “an aesthetic vehicle for experiments in taste” (Wilson 2003:8), which “molds our concept of what is considered beautiful” (Kawamura 2005:79). In the following, we will present the key perspectives of understanding fashion in fashion studies, including the perspectives that focus on clothing, human mind or social relations; meanwhile, their connections to aesthetic theories are also revealed. We also review the studies related to fashion in HCI.

### 2.2.1 Fashion in clothing

In fashion studies, the focus on clothing items is clearly visible in the studies of fashion design. Fashion designers have to consider color, fabric, silhouette and proportion to create an attractive clothing item. There are basic rationalist principles that designers have to consider. Some studies reveal those principles in order to facilitate fashion design process. For instance, McKelvey and Munslow (2011) argue that the “proportion” of designed product is a basic factor to create appeal for consumers. The proper combination of asymmetrical and symmetrical balance of the product, as well as a proper rhythm, can lift it to the highest appreciation level. This type of studies often aims to provide an efficient way for students to grasp basic knowledge in fashion design.

However, fashion design is far more than implementing the rational principles in making clothes. It is more important to be innovative and creative. To reach this goal, deviating from norms and rules is one of the efficient ways. Thus, in fashion, you could see clothing or styles that look “ugly” according to rational principles, as they are neither harmonious nor balanced. Ingrid Loschek (2009) discusses “vestimentary provocation” as one of the strategies to be creative in fashion design. It functions on complex levels of design: “through extreme overforming and/or extreme sexualization of the body, through political-religious associations, or through a provocative presentation of clothing” (Loschek 2009: 39). She argues that creativity in fashion could be reached through a provocative forming or presentation of the clothes on bodies. For instance, Japanese designer Rei Kawakubo shifts padding in dresses until it actually deforms the body, questioning the customary aesthetics (ibid: 42). In the Spring/Summer collection 1997 for Comme des Garçons which was named “Body Meet Dress”, she under-laid close-fitting jersey dresses asymmetrically at the back, shoulder and hip areas with big pads of cotton wadding. Through the strategy of abnormal deformation, she succeeded in a fundamental provocation (ibid). These provocative designs won her great fame in the Paris Fashion Week in the 1970s. This is one of the many examples to show that in fashion, “ugliness”, according to rationalist rules, could be considered as “beautiful” or attractive.

In sum, the view of “fashion in clothing” sees fashion as in physical garments. It concerns the sartorial practices in fashion design. There are very few studies focusing on the inner logic of the appearance of garments or styles in the academic field of fashion.

More research emphasizes the creative and unconventional aspects in the design of garments. It seems there are hardly any stable and universal principles of “fashion” in the form and expression of clothing, as we see a great variety of visual expressions of fashionable clothing or looks, which can be contradictory, inharmonious and imbalanced. It is the richness of styles and looks that drives researchers from various disciplines to examine the meanings of clothing. Instead of finding universal rules or inner logics, it is perhaps more important to investigate why there are so many different forms of beauty that are deviated from the universal rules.

### 2.2.2 Fashion in the mind

Some studies argue that fashion is in the mind of human beings. This is typically represented in the view of treating fashion as self-expression and a key role to play in identity construction. According to this view, fashion is seen as the expression of inner self through clothing and appearance, which is a way to construct personal identity. Fashion tells who you are and who you want to be. Clothes are treated not only as a shield for the body but rather as an extension of it (Cixous 1994). This enables us to use clothes as an extension of the abstract self. Philosopher Thomas Carlyle (2009) argues that the inner self is to correspond to the outer look and that one’s outer self ought to be the expression of a genuine spirituality. According to him, the clothing we wear is a reflection of the inner part of ourselves. A kind of consistency is required so that clothing becomes a communicative tool. In a similar way, philosopher Lars Svendsen focuses on fashion as identity construction. He claims “it is the question of fashion’s relevance for the formation of identity that has preoccupied me in this investigation, although fashion can of course be analyzed from many different angles” (Svendsen 2006: 11). He claims that fashion is much about expressing one’s individuality and clothing is part of the individual, not something external in relation to personal identity. Those studies treat fashion as visual representations of inner self.

### 2.2.3 Fashion in relations

Fashion historian Christopher Breward provides a broad explanation of fashion:

It is a practice, a fulcrum for the display of taste and status, a site for the production and consumption of objects and beliefs; and it is an event, both spectacular and routine, cyclical in its adherence to the natural and commercial seasons, [innovative] in its bursts of avant-gardism, and sequential in its guise as a palimpsest of memories and traditions. (Breward 2004:11)

He suggests that fashion is not clothing, but a practice, the production and consumption of objects and beliefs and the events of a particular kind. His definition of fashion represents another type of approach to understanding fashion, which treats fashion as something emerged from social relations. Such a view, which is dominant in fashion studies, has been discussed in various theories.

First, garments become meaningful only when they are in relation to social values and changes. This is typically visible in the semiotic account of fashion, which treats a clothing item as a sign. It is comprised of both the signifier, which is the form; and the signified, which is the content or symbolic meaning. Philosopher and cultural theorist Roland Barthes (1983) proposes a semiotic system of fashion through studying the language of fashion magazines. He argues that the written form of clothing consists of two interrelated classes of utterance: one includes all vestimentary features signifying clothing, like fabric, forms, color and so on; and the other circumstantial features, such as evening, weekend, shopping and lifestyle. The environment and contexts of clothing are intrinsically part of the language system of fashion. Moreover, Barthes argues that fashion, as a form of “taste”, both reflects and inflects people’s way of thinking and represents a form of historical and sociological “mentality” (Barthes 1983). He emphasizes that in the semiotic system of fashion, the individual elements never have any value and the signifiers make sense only when they are linked by a group of collective norms. The connotational meaning is a product of cultural beliefs and values. Different beliefs and values generate different meanings. Therefore, as the social contexts change, the signs will change accordingly.

This enables fashion historians to investigate the transformation of society and culture through studying clothing. Breward (1998) argues that clothing is read and decoded, through which associative meanings are combed out and cultural systems are established. The cultural systems constructed include symbolic power of the textiles and elements of decoration as well as the value entailed in its material and production that might together offer the evidence of status, nationality, age, sexuality or date (Breward 1998). In her influential work *Adorned in Dreams*, fashion scholar Elizabeth Wilson focuses on the changing aesthetic styles and their social and cultural meanings. She points out that a key feature of fashion is “rapid and continual changing of styles”(Wilson 2003: 5). She argues that fashion “enacts symbolically the most hallucinatory aspects of our culture” (Wilson 2003: 63). The evolution of aesthetic style reflects the discords in society, such as “the confusions between the real and the not-real, the aesthetic obsessions, the vein of morbidity without tragedy, of irony without merriment, and the nihilistic critical stance towards authority, empty rebellion almost without political content” (ibid). In all, fashion is a mirror of society.

Second, fashion is in the ambiguous relations between individuals and society; between differentiation and imitation. Fashion is intrinsically ambiguous and contradictory. This is typically shown in one’s desire for being unique and simultaneously belonging to a social community. Sociologist George Simmel claims that people use fashion to satisfy both the need for social adaptation and the need for distinction (Simmel 1997:189). Wilson has similar discussions. She states that fashion “can be a way of intellectualizing visually about individual desires and social aspirations”(Wilson 2003: 9). Fashion expressions sit uncomfortable between private territories of our physical body and our social and public beings, as “to dress fashionably is both to stand out and to merge with the crowd, to lay claim to the exclusive and to follow the herd”(Wilson 2003: 6). Thus, there is a tension between the requirements of differentiation and imitation, between individuality and society. In this sense, fashion is not an individual action, but rather an ambiguous social phenomenon.

Third, fashion is communicative to other people in the surroundings. In this view, fashion is treated as a particular type of communication through which people make public fashion statement. This view also emphasizes fashion as personal expression, which is shared with the view of “fashion in the mind”. But it does not stop here and continue to discuss the relations to other people. The communicational view highlights that the aim of fashion is to impress others through making fashion statement. This statement is inherently *public*. Otherwise it makes no sense to be “in” fashion. Thorstein Veblen’s famous notion of “conspicuous consumption” indicates that in order for the consumption to be symbolical, it should be publically visible to others (Veblen 2007[1899]). Overt consumption in fashion, especially luxurious fashion, is to show off and make one’s tastes accessible to the awareness of others. Wilson also emphasizes the importance of interaction with others in fashionable dressing, as she claims that every person is “a walking collage, an artwork of ‘found items’, or perhaps something closer to a contemporary installation, changing as it interacts with its audience” (Wilson 2003: 248). Kawamura also argues that fashionable dressing shows one’s wishes to “win approval or respect by appearing stylish, sophisticated or chic”(Kawamura 2005: 94). These studies demonstrate that fashion is intrinsically public, since its aim is to stand out in front of others. “To be seen” becomes the strong motivation to be in fashion.

In addition, the publicity of visual aesthetics in fashionable dressing is paid great attention to in the studies that concern social contexts of dressing. Entwistle employs Erving Goffman’s theory to discuss the way in which dress is routinely attended to as part of “presentation of self”. She argues that, as an essential part of public presentation of a person, dressing should take settings into consideration. Most situations, even including informal ones, have a code of dress, and these impose particular ways of being on bodies in such a way as to have a social and moral imperative to them (Entwistle 2000: 337). Thus one needs to consider settings when they select clothes from their wardrobes to create a look.

Fourth, fashion is argued to exist in the collective ideals and collective activities. Entwistle argues, fashion is about “clothes that are promoted and popularized as ‘attractive’, ‘beautiful’, ‘stylish’, or ‘chic’”(Entwistle 2009: 9). The promotion and popularization usually contain a set of collective activities. John C. Flügel argues that fashion cannot be entirely accounted for either in terms of individuals, either on the side of the producers or the wearers. For a new style of dress to become fashionable, it must in some way appeal to a large number of people (Flügel 1930: 40). The diffusion of fashion lies in a realm of collective ideals, aspirations and emotional dispositions. The presence of the shared ideals ensures that a distinctive set of forms, both material and mental, would be in circulation at any particular moment, and it is the collective ideals that shape the style of any group (Flügel 1930).

Other scholars discuss the collective activities of fashion. Herbert Blumer argues that fashion is a result of “collective selection” and is socially produced by institutional, social, and cultural relations between a number of key players in the industry. In particular, designers choose what garments to show in their collections, while journalists and retail buyers select items as the trend and the fashionable “look” for the next season (Blumer 1969). Diana Crane studies the social construction of fashion and examines the people, networks, and institutions that make up the fashion system. She treats fashion as collective activities, such as “the output of deliberation, conflict, and negotiation within a complex network of institutions and individuals”; and as “a symbolic product that anchors cultural dreams and social aspirations” (Blaszczyk 2009:9). Similarly, Regina Lee Blaszczyk argues that fashion is a cultural phenomenon growing out of interactions between individuals and institutions (Blaszczyk 2009:10).

Recently, sociologist Yuniya Kawamura recognizes there is a lack of research on the institutional factors in fashion studies and attempts to provide a systematic sociological investigation of institutional fashion in her research. She proposes a “fashion-ology”, which treats fashion as a system of institutions that produces the concept as well as the practice of fashion (Kawamura 2005: 1). The way garments being transformed into fashion is done through this fashion system, which means institutional and cultural arrangements that cause particular cultural objects to be adorned in a specific way. It is this social system that in intricate ways creates the constant fluctuation of taste, and links industrial production to the variations in consumer values (Kawamura 2005). The institutions of fashion can turn any item of clothing into fashion (ibid: 45). Kawamura highlights the role of designers in the system, but meanwhile argues that their works should be legitimized or “recognized” by other members in the cooperative activities through which their works are produced. This is a so-called star designer system. The legitimization is done by fashion gatekeepers, such as fashion editors and journalists, who hold the power of discourse in the industry and could influence the taste of public.

The four types of “fashion in relations” are in line with the social approach of aesthetics. All these discussions reflect the pragmatists’ emphasis on the social and cultural “environment” where the interactions among people, objects and society occur. In specific, the first type of “fashion in the relations” orients to the Marxist view of aesthetics that art and beauty are results of social structure and cultural contexts. The second type that concerns the ambiguous relations between individual and society in fashion is in line with Bourdieu’s theory on the social shaping of taste. The fourth type that refers to the collective activities of fashion is closely related to the institutional view of aesthetics, which argues that the creative works in contemporary society are the results of collective production; and they become art or fashion because they are legitimized by social institutions in the art/fashion world. Only the third type that focuses on the public statement of fashion in social interactions is not very visible in aesthetic theories.

### 2.2.4 Fashion in HCI

“Fashion” does exist in HCI literature. There are different ways of understanding fashion in the related works, such as fashion in the visual form of objects; fashion as expressing selves; fashion in the relations.

First, a lot of researchers in HCI treat fashion as the visual appearance of objects. First, fashion is seen as fabric and clothing. For instance, Fernaeus and Jacobsson (2009) argue that fashion studies is relevant to tangible computing because it essentially deals with physical features such as fabric, texture, transparency, shape and so on. Some researchers study virtual network or online social activities that concern clothing and accessories. For instance, Bardzell et al. study the fashionistas’ shopping of clothing items and content creation behaviors in an online community “Second Life” (Bardzell et al. 2010). Yamaguchi et al. (2014) apply a big-data approach to quantitatively study social influence in an online social network called “Chictopia” and specialized in fashion, which for them is equal to clothing. Moreover, there is a large area on fashion in interactive technology within HCI, called “wearable technology”, which combines informative technology with textiles or clothing. “Fashionable wearable” is a term used to refer to designed garments, accessories, or jewelry that combine aesthetics and style with functional technology (Seymour 2008). Some works on this topic investigate the technical challenges that can enable new functionality, such as smart clothes like the “Know Where Jacket,” which incorporates GPS technology, and the “Life Shirt” which measures health (ibid); while some works focus on innovative aesthetic expressions generated by new materials or technology, such as color-changing materials or data-driven variations in displays (Dunne 2011). Wearable technology provides publicly available displays that enable immense possibilities to vary the visual expression. Dunne argues that wearable technology “allows our personal devices to understand our context, activities, and needs implicitly, and shift color, texture, and shape to provide endless customization”(ibid: 42). Here, fashion is seen as particularly relevant to interaction designers, since they start to deal with soft material properties, such as texture, transparency, and shape in objects carried close to our bodies, which are typical design materials for clothing fashion. Second, fashion is also considered to be aesthetic qualities in the visual appearance of an object. For instance, Pan and Blevis (2014) argue that fashion entails visual appearance and qualities of form (hereafter, formal qualities, in the design sense rather than the mathematical sense).

Second, fashion is commonly understood as a key element to contribute to identity construction and self-expression. For instance, Perovich et al. (2014) argue that fashion is closely tied to identity and functionality and the clothes we wear affect our feelings and express them to the world. Pan et al. (2012) explain that their interest in fashion is more closely related to the ways that products are used to express identity and lifestyle. Fashion is considered as a legitimate avenue for self-identity and self-expression that determines how one is perceived and accepted.

Third, there are also some studies that see fashion as in relations. A few works concern the public presentation of fashion and attempts to design interactive system to account for that. For instance, Fernaeus and Jacobsson (2009) argue that fashion concerns how people present themselves to others through their surface appearance. Clothes serve a range of communicative functions, indicating e.g. appropriate behavior, group belongings, and expected interactions. Similarly, Liu and Donath (2006) also claim that fashion should be defined as public display of signals that send messages of any valued entity such as money, time, energy, reputation, etc. Fashion exists in a communication process. If one has access to information, such as going to the right places and communicating with the right people, one may disclose this “fashionable” quality in variably recognizable ways.

More researchers understand fashion as social activities or construction, but they use fashion studies as an inspiration to inform other type of design or examine the role of technology in specific social practices. For instance, Pan and Stolterman (2015) learn from sociologist Kawamura’s theory and recognize that “fashion is a social constitution that consists not only of fashion designers, but also consumers, models, advertising, media, and branding”. Then they propose that interaction designers should pay more attention to the social constitution of meaning making. Pycock and Bowers (1996) conduct ethnographic work on fashion design in the fashion industry and investigate the role of technology in the collaborative work, in specific, the Virtual Reality (VR) technology. They aim to study the real world work of design in depth to inform the development of systems.

Then there are a lot of design studies of new services or systems to support fashion activities, such as trend analysis, dressing and shopping practices, rather than designing digital technology that itself could be fashionable item that is integrated into the fashion practices. For instance, Shintami et al. (2014) propose a novel algorithm that automatically discovers visual style elements representing fashion trends for a certain season, based on studying fashion show videos. Hayashi and Masuko (2013) develop an innovative system of fashion coordination to help users selecting clothes from virtual stores or the users’ own wardrobes. Their system requires users to manually select clothes and put them together. While some other designs provide recommendations for matching clothing items. For instance, Iwata et al. design a system that recommends a new clothing item from the user’s wardrobe, given a selected item. It draws on analysis of outfits available in full-body photographs from fashion magazines (Iwata et al. 2011). Wardrobe has also attracted attentions from HCI researchers and interaction designers. For example, Hughes et al. (2012) design an emotional wardrobe that uses crowdsourcing mechanisms and multi-modal language to engage consumers in enriched tactile experiences of garments. Some researchers find that dressing is a social activity and attempt to design for this feature. Burton et al. (2012) focus particularly on people with visual impairment and test the feasibility of providing them the advice of dressing through crowdsourcing using VizWiz, which is a mobile phone application where participants receive nearly real-time answers to visual questions.

### 2.2.5 Conclusion

In all, existing research on fashion in HCI reflects the three approaches in fashion studies. First, in HCI, fashion is largely seen as in the visual appearance of an object or in the clothing items, which echoes the first approach in fashion studies that sees fashion as in the physical garments and accessories. Fashion studies highlight style, aesthetics and beauty in fashionable clothing. However, the clothing view of fashion in HCI seems to treat fashion simply as textile and a medium, emphasizing the functionality of interactive clothing while undermining the aesthetical aspects. Second, fashion is also understood as identity construction and personal expression, which is in line with the second approach of fashion studies. Third, fashion is discussed in relation to social relations. A few works concern the public presentation of fashion and attempts to design interactive system to account for this understanding. More researchers understand fashion as social activities or construction. However, they only use fashion studies to inform the design that is not aesthetic oriented, such as sustainable design. Or they design and implement technology to support social practices in fashion context. To sum up, fashion

Table 2 An overview of approaches in fashion theories and fashion in HCI

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fashion | | Fashion theories | Key areas and scholars | Fashion in HCI | |
| In the objects | | Visual features of clothing, such as color, textile and silhouette;  Proportions;  vestimentary provocation | Fashion design | Clothing or fabric (wearable technology)  Visual appearance of objects | |
| In the mind | | Expression of inner self | Philosophy  Thomas Carlyle,  Lars Svendsen | Self expression; identity construction | |
| In relations | | The meaning of clothing is related to social values and changes. | Semiotics: Roland Barthes  Fashion history: Elizabeth Wilson,  Christopher Breward |
| Ambiguity between individuality and social conformity | George Simmel,  Elizabeth Wilson |  | |
| Public statement to impress people | Thorstein Veblen,  Diana Crane,  Joanna Entwistle | Technology as public presentation of fashion | |
| Collective activities and ideals that produce fashion | John C. Flügel,  Herbert Blumer,  Regina Lee Blaszczyk,  Yuniya Kawamura | Fashion as social construction and practices  Technology as a supportive tool | |
|  |  | | | |

in technology, according to HCI researchers, mainly emphasizes visual qualities and personal expression or points to technology that is in the form of clothing or fabric.

Comparing these studies with fashion studies, we find that although the three approaches used in fashion are all visible in the studies on fashion in HCI, there are differences in the focuses between the two areas. There are a limited number of studies focusing on fashion in clothing and expressing personality in fashion studies, while both these views are dominant in the research on fashion in HCI. Furthermore, fashion studies stress much on the relational view of fashion, consisting of four types of relations; while such a view of fashion is much less discussed in the related works in HCI. Within the limited amount of work in the relation view, most of the studies aim to investigate or develop supportive technology to help fashion practices rather than designing digital technology that itself becomes a fashionable item integrated into fashion styles.

In addition, the contributions of fashion studies in HCI research are not distinguished, since many of the insights inspired from fashion studies in HCI are not necessarily gained through studying fashion. For instance, the importance of visual forms and their communicative meanings has already been highlighted in industry design, as Gui Bonsiepe (1963) states that the communicative aspects of the relationship between users and products are one of the most important parts of a theory of industrial design. Meanwhile, the most distinguished features of fashion, such as change and novelty, the ambiguity of fashion identity, social production, are still absent in the research on fashionable technology in HCI.

Based on the literature review, we believe that more profound understanding of fashion is still needed in this field. What fashion studies can offer to HCI should not be limited to the existing approaches. HCI could also benefit from the fashion theories that have been overlooked in HCI and provide insights on how to make things beautiful and desirable and could benefit HCI a lot, such as Kawamura’s theory of treating fashion as an institutionalization comprised of cultural arrangements and mechanisms.

## 2.3. Fashion studies and aesthetic theories

We have unpacked the three main approaches in fashion studies. We find that each of them echoes some points in aesthetic theories. However, we could not conclude that fashion is the same thing as aesthetics in academics. This section concerns the distinguished features of fashion studies in comparison to aesthetic theories.

First, the objects discussed in fashion studies are dominated by clothing items worn on human bodies, while the objects in classical aesthetic theories are artworks or nature. In a sense, fashion studies mainly concern the beauty of appearance of human being, such as the beautiful clothes, styles and decorations on our bodies. Aesthetic theories deal with painting, music, poetry and nature that we look at through our eyes. In this thesis, we focus on fashion, when we study beauty emerged from the design of digital technology. This is motivated by digital devices’ shared position on bodies with the traditional fashionable items as well as fashion’s long history of making adornment on our bodies. These devices might need to have some features of fashionable items so that they could become beautiful and desirable.

Recent fashion studies argue that fashion is seeping into various product domains in the consumer society. Entwistle claims that fashion, as a system of stylistic innovation, is to be found in other domains as well, such as in architecture and product design (Entwistle 2009). Nixon and Blakley (2012) propose that a form of “fashion thinking,” defined as a means of generating stories, experimentation, and open-sourcing, is used in innovation of a broad range of consumer products and services, e.g. food packaging and automobile design. So the objects in fashion studies now extend from clothing items to a wider range of objects in everyday life, which can include digital devices, such as mobile phones. Interestingly, some theorists in aesthetic philosophy, such as pragmatist philosophers, attempt to turn the focus of the discipline into everyday experiences where we interact with objects in mundane life. Then aesthetic experience could occur in our dressing, gardening and interacting with the mobile phones. Therefore, the boundary between the objects in fashion studies and aesthetic theories becomes more obscure than before. This enables us to discuss fashion in the digital devices as a way to study aesthetics of everyday life.

Second, aesthetic theories concern the issues around beauty. Fashion is about beauty as well, but it focuses on particular forms of beauty and taste, such as those that have novelty and change. Fashion emphasizes the newness and variation of both the styles and the ideas of beauty. Compared to aesthetics that is more stable, fashion is changing and looking for new trends. The concept of fashion indicates the latest trend and ideas about what is beautiful and desirable. Beauty could be obsolete and then lack of values in fashion. Fashion’s emphasis on variation also influences non-clothing domains, as Nixon and Blakley (2012) argue that non-clothing industries are forced to embrace faster manufacturing cycles if they want to tailor products to the needs of well-informed consumers.

Third, the most influential theories within aesthetic theories focus on the internal state or psychology of an individual toward the object to be appreciated, i.e. perception and judgment of beauty, sensuous emotions and imagination. However, fashion is rather a social phenomenon and it only makes sense when it is circulating around people. Fashion is featured by ambivalence and contradictory, since it not only concerns the expression of unique self, but also includes the desire for social conformity. Moreover, fashion in social relations also emphasizes social construction of the phenomenon. It is an institutionalized system that turns clothing into abstract fashion (Kawamura 2005).

In all, fashion’s connections to aesthetics allow us to study fashion as a way to approach aesthetics. Its strong emphasis on the relational view indicates that fashion studies might be able to contribute to how we understand the beauty of digital devices in social relations. In this thesis, we particularly highlight that fashion is distinguished from clothing. The production of fashion is not equal to the manufacture of garments or accessories. We are influenced by the institutional perspective of fashion and treat fashion as produced through institutional and cultural arrangements that could turn things into the idea of fashion. We also underscore the features of change and novelty in both fashionable items and the concept of fashion. For instance, temporal variation will be a key point to discuss in both the empirical studies and design explorations in this thesis.

## 2.4 The body

Clothes are among the most fraught objects in the material world of things, since they are so closely involved with the human body and the human life cycle. They are objects, but they are also images. They communicate more subtly than most objects and commodities, precisely because of that intimate relationship to our bodies and our selves. (Wilson 2003, Foreword vii)

Clothes become important, as they are so intimate to our bodies and construct part of the self. Our interests of fashion in mobile and wearable devices are highly motivated by the shared body position between the devices and fashionable items. A few sociological studies on the aesthetics of mobile devices show that people’s interests of beautifying mobile phones are increasing due to their getting closer to our bodies, sharing a similar position as clothing items. However, HCI’s understanding of human bodies in general differs a lot from that of fashion.

In fashion studies, the importance of body never lies in its being a biological entity. The body is a display, an expression, and an image. The naked body is clothed and dressed. As a whole, they construct an appearance of a person, as Arnold puts it, “fashion and make up are used as sexual tactics, to construct an alluring contemporary body, in reference to fashion images”(Arnold 1999: 490). It is argued that dress can enhance sexual attraction because it both reveals and conceals the body (Wilson 2003: 91). In civilized societies, biological body has to be covered by clothes and the dressed body is the actual social front. Meanwhile, clothes not only reveal parts of a body, such as neck, back or legs, for sexual attractiveness, but also shape the silhouette of a body, such as the corset in history that keeps women’s waists tiny or the wide shouldered suits in the 1990s that enhance the masculinity. It might be true that previously women dressed mainly for the gaze of men, but in contemporary society, dressing becomes more autonomous. Feminist writer Faust writes:

High heels and corsets provide intense kinaesthetic stimulation for women, appealing to the sense of touch but extending more than skin deep. These frivolous accessories are not just visual stimuli for men; they are also tactile stimuli for women . . .(Faust 1981: 49)

The author argues that fashion accessories could also satisfy women’s pleasure in their own bodies. With these stimuli, fashion conscious people treat body as the place to do aesthetical experiment. It is like a piece of white paper where people can paint and draw pictures. Mike Gane argues that the body “… is the site of the action of signs of the fashion system” (Gane 1991: 107). For fashion, it is the visual look that matters, instead of the internal bio information. The bodily experience in fashion often yields to the public aesthetic appearance. Thus women are willing to sacrifice the comfort to appear sexier and more attractive, for instance, in the classic example of wearing high heels.

On the contrary, human body in HCI, especially in wearable technology, is treated as the source for bio-data. Thus sensors are embedded to get the internal bio information. This kind of technology is developed mainly for the purposes of health and sport (Dunne 2011; Farren and Hutchison 2004). It is almost taken for granted that the “smartness” of the smart clothing lies in getting information of the biological body so that it could provide some sort of function. Wearable technology, although in the form of clothes, seems to underestimate the intimate and subtle relationship between the bodies and clothes, which has been particularly emphasized in fashion; instead, it brutally exerts power on bodies, treating them as sick subject, and turning the beautiful bodies into a collection of cold objective numbers. Even in some aesthetic-oriented wearable designs, the variation of display is mostly driven by biometric sensor data or environmental data.

This dissertation tries to shift the excessive attention on body as a collection of data in HCI to a focus on an aesthetical dressed body, which we see as a site of aesthetical experiment and statement. We here understand fashion in a broad way, not as clothing, but as institutional arrangements in social construction that turn clothing or any item into abstract concept of fashion. Production of fashion, in this sense, is not equal to garment making, but refers to a social construction of fashion ideals. This is why we focus on institutional activities in the empirical studies on the generation of fashion in mobile design.

Although mobile phones are getting closer to our bodies, they are not particularly designed to establish meaningful relations to the fashionable items on our bodies. Mobile phones are still something separated from our looks. We emphasize the close relationship between mobile devices and bodies, not in the sense of ergonomic, but aesthetical and visual-oriented. We here aim to explore how we can design a mobile phone or wearable device in relation to dressed bodies. In this sense, devices hold equal positions as other fashionable items in making an outfit, such as clothing, jewelry and shoes. The “smartness” of these devices then could be in how they could communicate with other objects in the surroundings; and how they could as a whole contribute to a fashionable outfit. This puts us in the same position as a fashion designer, who experiments different designs on a mannequin to create an idealized look. For us, the body is like that mannequin.

## 2.5 Conclusion

In this chapter, we have summarized the related works on aesthetic theories and fashion studies as well as their applications in HCI. Aesthetic theories include considerable philosophical discussions and some sociological research. There are mainly three approaches of understanding beauty in aesthetic theories, which are “beauty in the objects”; “beauty in the mind”; and “beauty in relations”. We turn to fashion studies in the second part of this chapter, since fashion studies particularly emphasize the beauty of people’s appearance. As fashion and aesthetics share the same interests in beauty, it is then no wonder that the approaches of understanding fashion in fashion studies reflect the three approaches of studying beauty in aesthetic theories. Meanwhile we also recognize the differences between the two areas. The literature review tells us that aesthetic theories treat beauty mostly in the individual perception while fashion is particularly seen as socially constructed in various relations. However, studies on aesthetics and fashion in HCI seem to have missed the most important differences between fashion and aesthetics. They have mostly focused on the perspectives of “in the objects” and “in the mind” while not much has been done in terms of beauty or fashion in relations. Even though there are many studies in HCI that concern relations in fashion practices, they tend to separate fashion and technology, using available technology or designing new technology to support the practices. In this way, fashion is considered as a particular context, which is in the same position as many other contexts that have been discussed in HCI, such as game, work and school etc. Digital technology works only as a supportive tool that meets various demands of targeted users. However, if we have a different understanding of digital devices, such as treating them as fashionable items, we might gain new insights on their design. Then we need to learn from fashion studies on how to make something fashionable and desirable.

Our literature review shows that both aesthetic theories and fashion studies have multiple views and approaches. If HCI wants to benefit from interdisciplinary theories to generate new design spaces, it should have a more thorough understanding of theories on related topics. We should be aware that there are so many different angels in aesthetic theories and HCI researchers should not be constrained by one theory. For instance, we could investigate the view of “beauty in relations”, which is seldom seen in HCI. Moreover, if we want to investigate the relational beauty in the design of digital technology, we might need to learn from fashion studies, as there is a strong focus on the relational approach of beauty in fashion studies. Being more specialized than aesthetic theories, fashion studies provide knowledge for more concrete aesthetic experience in particular contexts.

# 3. Methodology

This chapter presents and discusses how the research questions have been investigated and answered in this thesis. Important, the study does not aim to provide augmented solutions to a well-defined problem, but to explore new design spaces based on the social practices that have not gained sufficient understandings in HCI.

The concept of “design space” is understood as a conceptual space and “a space of possibilities” (MacLean 1991: 203) that designers navigate to understand design problems and to find good solutions. The exploration of design space could be understood as a process that sorts out the associations of a lot of heterogeneous forces, as what Juhlin et al. have proposed as a form of “associative design” (Juhlin 2010), in a way informed by Bruno Latour’s social theory.

Latour’s sociology underscores three points. First, society is formed through individual practices. He argues that society is not the referent of an ostensive definition discovered by social scientists, but is rather performed through everyone’s efforts to define it (Latour 1986: 273). Second, non-human materials should hold equal positions as humans in linking us together to form the society. Each performative definition of what society is about is reinforced, underlined and stabilized, by bringing in new and non-human resources. It is the heterogeneous forces that make us linked together (ibid: 276). Third, his way to define sociology is to make it the study of associations. The heterogeneous forces are bound together to create machines and machinations that keep us all in place (ibid: 277).

Accordingly, Juhlin (2010) suggests that a heterogeneous net of studies, including empirical studies, design and development activities, should be associated in order to investigate a particular space. Participants with different backgrounds and expertise in a design project engage in all the parts of the exploration. A design space per se emerges from combining and juxtaposing already established domains. He argues that this approach best suits the research that is exploratory rather than solving a predefined problem.

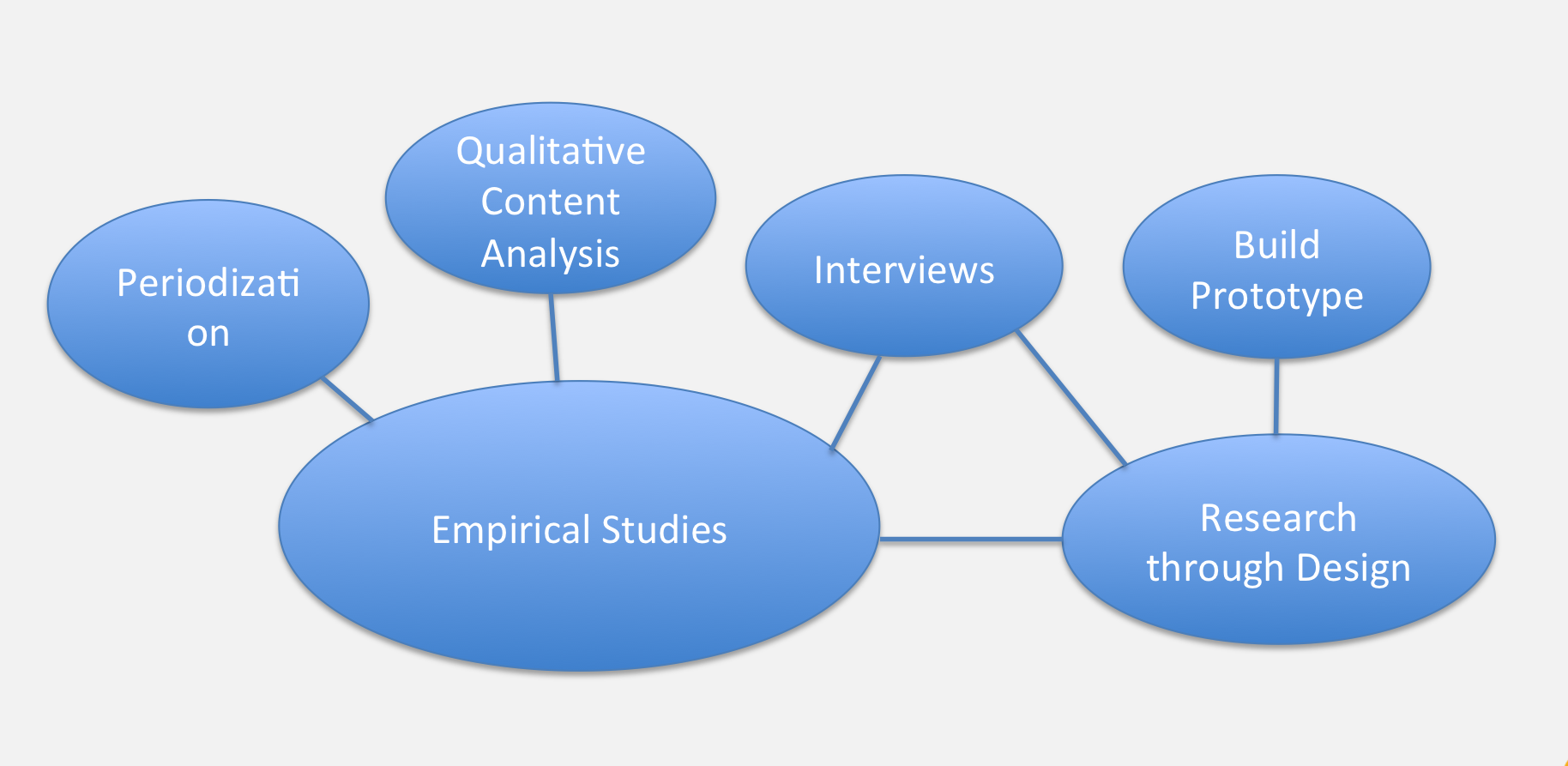
In our case, the domains that offer a lot of possibilities include aesthetic theory, fashion studies and human computer interaction. We aim to explore *how aesthetization in general and fashion in particular occur in mobile design* as well as *how we could design digital technology to extend the fashion’s influences.* The aims are best understood as exploring the design space emerging from the intersection of aesthetics, fashion and human computer interaction, instead of offering a best solution to a predefined problem. We undertake the task by associating two types of research together (Figure 3-1).

Figure 3-1 An overview of methods

The first type of research is empirical studies. They are carried out in order to investigate the concrete social practices that have led to aesthetization or fashionalization in mobile design. Doing such studies is motivated by a lack of empirical support in the previous literature on “aesthetization of everyday life”, which mainly rely on general observations made by viewing products at a distance (Tseëlon 2001: 436). They are important for inspiring new studies, but we need more extensive empirical indications and discussions of both how this trend emerges in particular domains and why it happens. In particular, this is done through a mixture of methods, including both quantitative and qualitative methods. Researchers argue that linking different qualitative and quantitative methods becomes essential (Kelle and Erzberger 2004). Research topics in sociology tend to be more interdisciplinary and there is a trend of combining different methods in sociological studies. For instance, Flick identifies the trends of “hybridization” and “triangulation” in qualitative research. The former is evident in many of the research perspectives and schools, such as ethnography, cultural studies, and grounded theory research. Researchers select multiple methodological and pragmatic approaches to avoid a restricting subscription to a specific methodological discourse. The latter goes beyond the limitations of a single method by combining several methods and giving them equal relevance. It is becoming more fruitful if different theoretical approaches are combined or taken into account in combining methods (Flick 2009). Researchers of one discipline should not avoid using the methods and modes of analysis of other disciplines when these could contribute to an understanding of a particular problem under investigation (ibid). In our case, the studies with different methods not only help understand the related social practices, but also provide us design implications. However, although combining various methods can explore the questions by touching upon a wide range of points, it cannot examine all possibilities. As Biskjaer et al. (2014) argue, a design space is a construct based on constraints. The constraints are shown, for example, in the fact that it is developed by the designer on the basis of his/her knowledge and experience in response to external conditions such as the terms of a contract, a design brief or the materials at disposal. Thus the methods used to explore new design spaces never give a full picture of the area.

The second type of research is design explorations that aim to explore how to design digital devices that can extend the influences of fashion. Design has been shifted from merely problem solving and usability engineering to a broader area that contains creative and explorative practices (Löwgren and Stolterman 2004). The method of research through design (RtD) was introduced to HCI to emphasize the designed artifact as an outcome in which the knowledge generated is also embedded (Zimmerman et al. 2007). The knowledge intends to be “generative and suggestive” rather than provide generalization through falsification (Gaver 2012). We have done two design explorations to investigate the concrete problems emerging out of the empirical studies, i.e. how to design for public visual aesthetics that could match the outfits and adapt to the variations.

In the following, we will present the main methods that have been used to conduct those two types of research in more details.

## 3.1 Periodization

We apply a historical perspective to study the everyday objects, mobile phones. In order to unpack the broad trends of the changing styles of mobile phones, which might not be visible in the design of individual devices, we conduct a historical periodization. This method refers to “the process of dividing the chronological narrative into separately labeled sequential time periods”(Hollander et al. 2005). It is not employed just to disconnect single historical facts, or simply to divide time into smaller parts, but in order to emphasize the key features and turning points of each period so that we can see the variations and evolutions. Periodization is often performed as a form of historical investigation, and the divisions are based on large amount of empirical material. It can facilitate our understanding of a particular history by breaking it into smaller units, by focusing on specific time spans, and by promoting easier recall (ibid).

Taking such a view is influenced by a strong focus on history within fashion studies. Fashion history deals with the changing styles and looks of people in certain historical periods, in which clothing and costumes, as the important carriers of social values and meanings, are central objects to discuss. Fashion historians have written a lot on the drastic changes of styles, from “New Woman” in 1900 to the “poor look” created by Chanel in the 1910s; from Dior’s ultimate feminine design of “New Look” after the Second World War, to the “Grunge” style in the 1990s (English 2013). It is the visual styles of clothing and looks of people that become the central features to mark a period. The styles of clothing usually integrate particular visual elements, such as the full skirt and tight waist of the “New Look”.

Then we turn to the historical research of mobile phones. Existing research on such a topic focuses on the technological development of mobile phones, which is like discussing the sewing and pattern making technique in making clothes, instead of the final presentation of the clothes. However, if mobile phones were treated as aesthetical objects, it would be necessary to examine the aspects other than the instrumental ones, such as the visual features that could stimulate pleasure and enjoyment. Some sociologists have argued that historical methods can be very valuable in the sociological research, since “if we are to expand our understanding of contemporary life, we must look to the transformations through which we have already passed” (Gray et al. 2007: 243). Similarly, we could argue that if we are to expand our understanding of aesthetization in mobile design, we should look to the transformations of visual appearance through which mobile design has already passed.

We choose to focus on phones designed by one company, Nokia, since the company has been one of the biggest producers in mobile history, and it has been recognized as a pioneer in making mobile phones stylish (Djelic and Ainamo 2005). In order to identity the key features of a period, we conduct a quantitative analysis on the images of Nokia phones we have collected. Quantitative methods have been used in the research of dress history. Clare Rose (2010) studies the making and selling of schoolboys’ clothes in late-Victorian England by applying a quantitative method to analyze photographs. She argues that the quantitative analysis of separate sources provided a multi-dimensional picture of the topic and gave a firm evidential base for the discussion of clothing practices and their meanings (Rose 2010). In our case, we collect pictures and information of all the models and the release year for each phone in online materials. We are unable to access to all physical phone models from Nokia released over the two decades. However, the product photos and information of the looks of the Nokia products are widely available on the Internet, which offers another way to access to the visual features of Nokia phones. The increasing importance of digital technology in everyday life has great impacts on both the content and methodology of sociology. Flick (2009) argues that Internet could be used as a tool, resource, and issue of research. We argue that online materials can be used as secondary sources for historical analysis.

Online materials in this study include online catalogue and manufacturer information of Nokia phones, official document from the company and online museum contributed by many users etc. The diversified information of these materials makes our analysis possible even if the actual objects are absent. In order to facilitate the validation of data, we have collected and cross-verified materials from four sources. In total, 627 models of phones released between 1992 and 2013 are collected. Next we analyze the form of each item and then develop a set of fourteen aggregated categories (see Figure 2) that bring out salient characteristics of the phones’ visual expressions and represent all the manifest forms in our corpus. The aggregation is conducted following a qualitative approach, whereby themes are developed by attending to the visual expression of each item (Patton 2002). The number of releases of the Nokia phones with different forms for each year are put together and visualized in a diagram. It shows the trends of changing styles of Nokia phones in a direct way, for instance, when are the “ups and downs”.

## 3.2 Interview

Interviews are one of the most pervasive qualitative methods. It offers an easy way to get access to activities that are momentary, or to activities that take place in settings in which recording or observing would be difficult (Brown and Juhlin 2015: 196). This is an effective way for researchers to get people to recall their experiences, actions or behavior.

This method is appropriate, because the social practices that we aim to investigate are somewhat “momentary” or in the settings where “observing would be difficult”. For instance, the practices done in the past were “momentary” and it was not possible for researchers to participate, as in the historical study; dressing practices are privately done in the setting where observing is difficult, as the field studies before the two design explorations. In specific, interview is used in three ways in this thesis:

First, interviews were used to get the oral reports from the participants that took part in the past activities or events. Those oral reports will be valuable materials from the eyewitnesses, who preserve tacit knowledge, experiences and objectives of past events (Mårtenson 2012: 113). This is used in the study of the periodization of changing styles in Nokia phones.

Second, we used this method to get empirical materials from the participants of social practices. In order to understand aesthetization and fashionalization in mobile design, we interviewed people who are involved in the mobile design process from both the mobile industry and the fashion industry. It is important to ask relevant questions in order to get valuable insights from the interviewees. Our questions focus on the concrete details of what the interviewees do in their daily work, such as which activities are connected to the fashion industry, whom they meet and where they go. If we want to observe and record these activities as what an ethnographer normally does, it means we would need to spend much time following a few targeted persons in various companies, which will be difficult in practice. Thus interview is a practical way to collect empirical data of such practices. Furthermore, in our design explorations, we highlighted studying social practices before we start to design concrete things. This is neither to identify problems through giving the participants tasks nor to gain detailed design requirements, but to observe and better understand an activity that is relevant to the design ideas. Thus qualitative methods are more suitable than quantitative methods. Both of our two design explorations started with interviews with fashion conscious people on the matching and dressing practices.

Third, we used interviews to acquire initial user feedback for the designed exemplars. In HCI research, usability tests, which are usually in the form of quantitative measurement, are commonly used to examine whether a design is successfully implemented or not. However, our initial user studies, as an essential part of the associative design exploration, aim to gain early feedback on our design concepts, represented by the exemplars instead of testing how well the design could function. Explorative design drives us to use qualitative interviews to gather user feedback. Since we explore the visual aesthetics in matching and dressing practices, our attention is directed toward the visible features, such as the positions, textile, shapes and colors of the exemplars, which are to be seen at a glance. In specific, the interviews for the “shape-switching” device were done in situ, i.e. at the participants’ home next to their wardrobes so that they could easily create outfits with the mock-ups. The interviews were done during their activities, including selecting clothes and matching the mock-ups to them. The many outcomes from those activities, including mock-ups being situated on different positions of outfits, were made possible as the interviewees laid out their outfits on the bed or floor so that they were not constraint by the practical problems, such as being unable to attach to the outfit. The interviews to get the early feedback for the app “Watch for Figuracy” were mostly conducted outside of the participants’ home, since it was not required to stay close to their physical wardrobes. Four out of five participants tried the app in the researchers’ office. They all used their own clothes as the input data and created outfits that matched the color of smart watch face with their clothes. In both cases, the potential users created many outfits or ensembles, which integrated the design exemplars.

### 3.2.1 Sampling

To conduct interviews, we need to decide whom to be interviewed. In this thesis, we need to look at two groups of people. First, in order to investigate the aesthetization and fashionalization in mobile design, we need to look at the insiders or experts who play a key role in the design of mobile phones. The second is the fashion conscious people, whom we need to interview to understand their dressing practices and to investigate how they use the design exemplars we have built. Fashion conscious people are those who pay great attention to their external appearance and those who are avid and passionate surfers in the image-driven consumer cultures (Wan et al. 2001). They value the brand names of the products they consume; they spend money on clothing and appearance-related products (ibid); they have the desire for up-to-date styles, frequent changes in one’s wardrobe and pleasurable shopping experiences (ibid). One does not have to be a fashion opinion leader or a fashion innovator to be considered fashion conscious (Nam et al. 2007). To recruit relevant interviewees, we have applied different sampling techniques.

First, in order to examine what is going on in mobile design, we applied the method of “snowball sampling” to gather the interviewees. Our studies focus on the design of mobile phones, where many individuals are involved. People in different positions may have different impacts on the final products. It is then important to interview the persons who play a key role in the process, since one in a high position may have stronger influences in the decision making process. The interviewees are selected through “snowball sampling,” a method in which interviewees are asked whom the researchers should meet next. This enables researchers to “follow the patterns of established networks, friendships, and acquaintanceships with like-minded individuals” (Gray et al. 2007:117). It is an invaluable tool for “gaining access to informed and experienced people who may provide in-depth information available nowhere else” (ibid). In our studies, we were able to start with someone in a high position in the mobile industry. For instance, in the periodization of Nokia phones (Paper 1), we started with Tapani Jokinen, who joined the design team in Nokia in 1995 and was Head of the Mobile Phones Design Portfolio Planning at the time of interview. With this method, we interviewed five persons in total who used to be in the critical position in the design group in the company. In the study of fashion’s impacts on mobile design (Paper II), we began by interviewing Jeanna Kimbré, a highly relevant person who was Head of Color and Material Design at Sony Ericsson at the time. In this position she managed important parts of design at a major mobile producer at that time. In this industry, color and material designers are responsible for making the appearance of a mobile device, which has an orientation toward aesthetics. Based on her recommendation, the next interview was with Louise Klarsten, CEO at Color House, who had sold many trend books to Kimbré’s group. Following this method, we interviewed altogether eight persons with expertise in either mobile design or fashion trends. In all, interviewing key persons in both industries offers rich empirical materials. Although they cannot represent all views from either Nokia or the mobile industry, their comments are valuable as they express themselves in concrete terms and provide additional weight to the discussions of “aesthetization of everyday life”, given their critical positions in the industry.

Second, we recruited fashion conscious people through two ways, recommendation or self-report. We have done two fieldwork studies on matching and dressing practices before carrying out the design implementations: one focused on matching clothes (Paper IV); the other focused on matching wristwatches and smart watches in their making an outfit (Paper V). After the prototypes being built, we have also interviewed fashion conscious people to try them out. In most of these studies, the interviewees were recommended as stylish persons by our colleagues and friends. Recommendation indicates that these people have already had some impacts on the people around them and have been recognized by other people as physically attractive in terms of dressing. One exception was the study of wristwatches in dressing (Paper V). Since we could not find any acquaintance that has wristwatches, we need to recruit people from outside. The requirements of the interviewees were confirmed through emails when we further contacted those who were interested. In the end, the interviewees selected were self-reported as fashion conscious, since they pay great attention to dressing and styles.

## 3.3. Qualitative content analysis

Contentanalysis is a common method to study all types of content, including language. It enables the researcher to study a large number of textual information and systematically identify its properties through coding, such as the frequencies of most used keywords (Krippendorff 2004). This approach could be very quantitative or computer-based, but we use the *qualitative* content analysis. It is a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use (ibid; Patton 2002). It aims for the “qualitative data reduction and sense-making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings”(Patton 2002: 453). The concept of “qualitative”, rather than quantitative, makes visible that the analysis moves beyond systematic data coding to identify trends, and also allows us to interpret the material given theoretical preconceptions (ibid). In our case, the interpretations are informed by fashion studies.

In this thesis, we have used the method to analyze two types of materials in the written form. The first type of material for qualitative content analysis is the transcript of interviews. All the interviews were audio recorded and transcribed into texts. Then we close read the texts and categorized them into themes that were drawn from fashion studies. For instance, in the study on the fashionalization in mobile design (Paper 2), we have made three themes: 1) the fashionalization of mobile design; 2) interactions between the fashion industry and mobile design departments; 3) marginalizing fashion in mobile design. There were sub-categories, such as trend forecasting as a joint locus in the second theme.

Second, another type of material is the posts collected from online fashion media. This was to investigate how mobile phones are institutionalized into fashionable items. Nowadays, digital technology has brought fashion gatekeeping a drastic change. Almost all paper fashion magazines have their online versions now, and influential bloggers become a new group of fashion gatekeepers (Kurutz 2011). Both fashion editors in online fashion magazines and fashion bloggers are seen as new fashion gatekeepers, who play a significant role in legitimizing the ideas of fashion. Meanwhile we are also aware that those persons generate discourse, which is of great importance for fashion diffusion. In our study, we have examined a large amount of online fashion magazines and blogs and finally collected 145 text entries concerning mobile phones in online fashion media. Then we categorized them into six themes according to fashion studies.

Studying online fashion writings is obviously different from interviews. Interviews provide an effective way to get the details of the activities, feelings and perspectives of a set of participants. Our online data is only in the form of text and image, which makes it more difficult to see what detailed feelings these fashionable people have toward mobile phones, than if we had followed some of them in their ordinary lives or had interviewed them. However, our method has its advantages: first, blogs and online magazines provide practically available empirical materials in an area where gathering data is often a challenge, such as studying aesthetic experience. Bloggers and editors write down their experiences of looking at a new fashionable phone or holding one at hand, hence the personal experiences are transformed into words, on which we could do content analysis. Second, Internet provides detailed empirical data from a lot of invisible persons, compared to qualitative interview, which only requires a limited number of participants. In this study, it is what the fashion gatekeepers say about mobile devices that is important, instead of which persons say. This is different from the other two empirical studies, in which we had to find important persons. Third, online writings can break the geographical restraints and offer gatekeepers’ descriptions and opinions from various places. In a way, the researcher can “reach distant people without traveling”(Flick 2009: 178). While field studies or interviews are usually constraint by geographical locations. In this sense, studying online writings might get the widest range of opinions.

## 3.4 Building prototypes

In order to investigate how to design for fashion institutions and extend the impacts of fashion, we have done two design exercises in which we turn the design ideas and the learning from other studies into concrete instantiations by making prototypes.

We apply a research through design approach to explore how to design digital technology that can account for fashion’s institutionalized values. Research through design (RtD) is a method that emphasizes designing instantiations that embed and visualize new knowledge (Zimmerman et al. 2007; Gaver 2012). Instantiation takes the form of possible design concepts embodying an abstract property or feature (Gaver 2012). Its main aim is to support the understanding of the related abstraction. Design artifacts or exemplars, which can be seen as a form of instantiations, are discussed as physical objects constituting, containing and constructing knowledge (Pierce 2014). They can be directly understood and used by potential users as one possible solution to relevant topics. The core of the RtD approach is that design exemplars are treated as an outcome where the knowledge generated is embedded (Zimmerman et al. 2007). The goal of building the exemplars is rather to demonstrate a research contribution or generate knowledge than making functional systems.

In our case, we have built mock-ups and prototypes that could exemplify the design ideas of “outfit-centric accessory”, which refers to designing for public visual aesthetics of digital devices that could match the outfits and increase the variations. Our goal is to generate design implications through concrete design exemplars, rather than offer a solution to an existing problem.

Our design explorations result in two types of design exemplars: one is low-fidelity prototype. The other is relatively high-fidelity experimental prototype. The different forms are selected according to the goal of each exploration. Low-fidelity prototype is the visualization of design ideas at very early stages of the design process (Sefelin et al. 2003). The result is a prototype, which is simple and whose development does not cost much time. This method has received great recognition in the field for their ability to validate designs and predict large problems at an extremely low cost (Virzi et al. 1996; McCurdy et al. 2006). Inspired from the emerging organic interface technology, we have designed an imagined “shape switcher”, which is a future device that could match the outfits and adapt to the variations. The concept was instantiated in twenty-two shapes made of different textiles and in four colors. Since the technology that may make our design idea happen is currently at an early stage, making low-fi mock-ups, such as those made of textiles, could visualize our design ideas and make it possible to explore future use of innovative technology with users at a very early stage.

The shape-switching device explores the three dimensional hardware design of a mobile device to create variant public visual aesthetics that is outfit-centric. More opportunities could exist in combining hardware with software. Since the approach involves software, we need to develop functioning prototype so that we could further explore the idea by asking people to try it out. Our second exploration turns to wearable technology, which could provide public visual surfaces with possibilities for endless variation of aesthetic expressions. We focused on smart watches and have developed a smart watch application called “Watch for Figuracy”. This design is to explore the potentiality of designing fashionable wearables through a mixed approach, instead of making an end product with perfect usability. The application could make changes of watch faces in response to the garments people wear. Thus it provides some fashion “smartness” that is contextually dependent on the wearer’s current dressed ensemble. Unlike the “shape-switching” design that concerns all visual features of a device such as size, color, material and shape, the smart watch application focuses on one particular visual feature of wearable devices, color, and aims to explore the color matching between the smart watch face and the clothing people are wearing. This design is a functional experimental prototype, which makes uses of available software of digital wardrobe as well as available algorithm based on color principles. It has higher fidelity compared to the first exploration, but is still far from mature commercial product.

## 3.5 Ethical issues

Ethical issues could be discussed from different stages during research. In the phase of data collecting, we need to consider the ethical issues concerning data collection from individuals and from companies. First, all the interviewees in pre-design studies and initial user studies were informed in advance by signing a consent form (Creswell 2013). In this thesis, semi-structured interview is used as a main method to collect data. Giving the participants consent forms ensures that they know what the interviews would be about and permit us to record the conversation and use it for research. The forms also guarantee that their privacy would be protected during and after the research. Each interviewee signed two copies. He or she kept one and the researcher kept the other one. The concrete interview questions, which were highly influenced by the research questions of the thesis, mainly concern visual aesthetic experience, such as matching and dressing, or experiences of our new designs. These would not cause physical or metal damages, which psychological experiments might cause. Second, we need to consider intellectual property when we use the materials produced by a company. For example, in the study of a periodization of Nokia phones, some of the interviewees in Nokia showed us various materials, including power points and videos of general strategies and design decisions for specific phones. We have got the permission to use those materials for research by signing a contract with Nokia.

When presenting the data in our papers, the participants mentioned were anonymized in most cases, but in two studies (paper 1 and 2), we showed the names of the interviewees and their titles in the companies. Those two studies aim to provide empirical studies to support the view of aesthetization in mobile design. The positions of the interviewees, i.e. insiders of the fashion industry or the mobile industry, were of great importance to contribute to the topics. Therefore, we had to reveal the information of the interviewees to proof that they were in a critical position in the companies. They were informed in advance that we might quote their words in the papers.

This chapter deals with how we investigate the three research questions framed in the introduction chapter. We orient to an associative design method to investigate the new design space emerging from the discussions. In the design process, we associated different materials, including theories, empirical data and available technology. We combined and recombined various studies that consist of both empirical analysis and design prototyping. A multi-disciplinary group of researchers collaborated and communicated in the whole process.

# 4. Unpacking Aesthetization and Fashion in Mobile Design

This chapter addresses questions on *how aesthetization in general and fashion in particular occur in mobile design*. We will start with discussing the aesthetization of mobile design in history. Then we continue to investigate fashion in mobile design and how we could understand the connections. Lastly, we turn to fashion institutions to see how mobile phones are turned into fashionable items in the fashion system.

## 4.1 Aesthetization in the history of mobile design (Paper I)

We have studied aesthetization in the design of digital devices. Culture critic Virginia Postrel (2004) suggests that there is an ongoing trend of stylization or aesthetization of objects since the 1990s, i.e. an increased design variation of the same type of products. There is an “aesthetic abundance”, and “co-existence of many different styles”, as well as heterogeneous and constantly changing manifestations of beauty (Postrel 2004: 9-10). Aesthetization of everyday objects is also a topic in design research. For instance, Cushman and Rosenberg (1991) argue that aesthetics is becoming an additional critical dimension in product attributes. The visual form is a way to impress consumers, as it provides sensory pleasure that affects the quality of life. Such a trend is visible in the style variation of a single consumer product, e.g. in color variation. The mid 1920s saw an explosion in the use of color for interior fixtures, kitchen appliances, and floor coverings (Eskilson 2002: 26). On a more abstract level, sociologist Mike Featherstone argues that there is an “aesthetization of everyday life” during the last century where the boundary between art and life is increasingly blurred, e.g. visible in the increased attention to images in media (Featherstone 2007). Those readings of aesthetization in everyday objects motivate a detailed and empirical study on the availability of increased visual aesthetics in everyday objects, such as the ubiquitously available mobile phone.

There are some studies in sociology on how mobile phones are consumed as fashionable items (Fortunati 2005; Ling 2003; Skog 2002; Katz and Sugiyama 2006). But when it comes to the role of aesthetization in the production, we know very little about that of the mobile industry in general and its connection to fashion in particular. In order to better understand these relations, we conduct a historical study focusing on the transformations of the visual styles in mobile design in the short history to see the visual trends of mobile phones. We chose Nokia phones for the study because it has been one of the largest producers of mobile phones in history, and has been recognized as a pioneer in making phones stylish (Djelic and Ainamo 2005).

We develop fourteen aggregated categories (see Figure 4-1) that bring out the salient characteristics of the phones’ visual expressions and represent all the manifest forms in our corpus. The term “manifest form” is used to refer to a particular type of visual appearance, including shape and silhouette, color and materials, available by inspection of either a single mobile phone model, or a series of models.

A mobile phone model points to a specific version of a Nokia phone. Differently styled columns represent different manifest forms. Based on the statistics, we further divide the two decades of Nokia phone releases into four periods, which we call Candy-bar, Color, Grand and Slate (see Figure 4-2). These names reveal the periodization categories, which consist of a higher level of terminology than the manifest form.

Figure 4-1 The number of models in manifest forms each year between 1992 and 2013.

1) *Candy-bar period*: From 1992 to 1997, most Nokia phones had a long rectangular shape, similar to that of a chocolate bar, hence the name “Candy-bar”. The devices had a number of physical keys, and at the beginning of the period some had a visible antenna.

2) *Color period*: In 1998, the Candy-bar shape was complemented with a new design feature, changeable cases, which changed the visual expression drastically. The number of the models with this form was 66 out of 121 models in total, more than half of all the models in the period. The changeable cases, which are officially called “Xpress-on covers”, are removable, allowing consumers to choose a color for the back of their phones from a collection of covers in different colors. Users can easily snap the Xpress-on covers on and off in seconds without any tools.

3) *Grand period*: it had a much-hyped variation in mobile phone releases in combination with a visible orientation towards fashion. The defining features include: first, an introduction of new manifest forms, including one manifest form with a large number of models i.e. the clamshell model and seven manifest forms, each of which included a sole or a few models and were released during a short time; second, a continuously increase of the amount of manifest forms, which reached thirteen in total. In 2004, the release of nine manifest forms reached the peak of visual variation, as compared to the entire period we studied; third, an evident and visible orientation toward the fashion industry.

Figure 4-2 Bounding the manifest forms into periodization categories

4) *Slate period*: It is defined by a decrease in both the total number of releases and the variety in visual expression. Between 2009 and 2013, the number of models released declined. More importantly, the number of manifest forms was reduced from six in 2009 to three in 2013. From 2009, slate smart phones became dominated in the releases of Nokia phones. These phones take the form of a flat thin slate and rely on touchscreen technology to allow interaction.

We here emphasize that what we see in Figure 4-2 is an overall trend, rather than specific aesthetic considerations in the design of a single product. The periodization reveals key features and turning points of visual styles for each period during the decades. It also tells us that there were interests in visual attraction in the design of Nokia phones during the past two decades. However, the interests varied a lot. When there was more variety in the appearance of Nokia phones, it indicates that there was more attention and interest in the visual styles of mobile phones. What stands out as a key period is the Grand period. It was preceded by a period where color variation was made possible and followed by a decline in the variety of visual aesthetics. This indicates that what previous scholars have discussed as aesthetization of everyday life is not a continuously proceeding trend, but something that varies over time.

In order to understand why there were changes and turns as our periodization depicts, we interviewed a few key persons who used to be or were still at Nokia when the interviews were carried out. Our interviews show that the increasing variation of aesthetics in Nokia phones is socially constructed. Before the Grand period, the visual variation was made possible by the invention of “Xpress-on covers”. They were initially designed as a way to visually differentiate one device from another, instead of pursuit of beauty. So it appears that the idea of personalization preceded the orientation toward fashion.

Treating a mobile device as a personal handset indicates that designers need to take into consideration different demands from different consumers. This resulted in the customer segmentation system used internally by the Nokia design team to target different groups. It became a core capability of the company during the 1990s (Karjalainen and Snelders 2010). Frank Nuovo, who was the Chief of Design back then, was the key person in the establishment of this system in a project called “99”. The project was started in 1997 with the goal of designing phones for different customer categories within the next two years. The vision was a result of years’ accumulation of knowledge. The project proposed a new vision that treated mobile phones as similar to existing wearables, such as watches and pens. This was a mental leap forward in time and predicted what would happen when this emerging technology becomes more stable. The idea of segmentation then became the core idea of this vision. It resulted in six categories, including basic, expression, classic, premium, fashion and active. In this way, Nokia’s large customer base was sorted into abstract segments. The establishment of this system contributes to the birth of the Grand period.

During the Grand period, the hyped visual variation was much related to Nokia’s intension of getting close to the fashion industry. In so doing, Nokia could gain some effect of fashion and appeal to fashion oriented consumers. This is done through the following ways: the designers employed fashion concepts in mobile design, such as “collections”; they used the same trend books as clothing fashion; they collaborated with star fashion designers in designing the hardware of accessories for mobile phones. All these approaches, borrowed from the fashion industry, contribute to the variations of visual aesthetics of mobile phones.

After 2009, the models and visual variation of Nokia phones were remarkably reduced and the category system was gradually collapsed. The touchscreen technology has played a critical role in accelerating the process. The designers combined all their learning from previous experience, e.g. customer segmentation and color variation, into the strategy of rebuilding the brand by focusing on a few models, however they seem to have misjudged the stability of the industry. When new touchscreen technology in the Slate period changed the trend in visual appearance, the mobile device changed from a mobile phone that had stabilized technology to a device that supported Internet services. The design team may have rightly understood consumer desires but balanced them poorly with technical innovation. In this sense, the aesthetization of everyday things seems to be more dominant when the level of technical innovation is relatively low, such as in clothes manufacturing, and becomes more complex when it merges with technical areas.

## 4.2 Unpacking fashion in mobile design (Paper II)

The historical study of Nokia phones shows that the aesthetization in mobile design was connected to clothing fashion in some ways. This motivates us to further examine the concrete connections between clothing fashion and mobile design.

To unpack the role of fashion in mobile phone design, first of all, it is essential to discuss the relations between fashion design and other types of design. They all belong to *design*, which is generally defined as human shaping of the environment in ways without precedent in nature, in order to serve our needs and give meanings to our lives (Heskett 2005: 5). So design is a broad concept that contains a wide spectrum of practices, such as interior design, clothing or fashion design, and product design. In this sense, the identification of fashion practices in mobile design is conflated with the argument that mobile phones are becoming increasingly “designed,” as both of them have already been “designed”. If we define design more narrowly, such as ways of “thinking” or institutional work, we will get a different understanding of the overlaps and distinguishing features.

In this thesis, we understand fashion as what Kawamura (2005) suggests, i.e. cultural mechanisms or institutions that make objects aesthetical and desirable (Kawamura 2005: 1). If we want to understand how fashion emerges in other objects than garments, we need to understand the institutions, such as established and legitimized law, norm or values (Scott 2004) that make this happen. Thus we can treat both fashion and design as certain institutional work. Meanwhile, we are also aware of the obvious differences between fashion thinking and design thinking. The former focuses on aesthetics, creativity, and innovation in the domain of appearance while the latter emphasizes problem solving and uses a user,centered research method to frame problems (Martin 2009; Pacione 2010). From an institutional perspective, it is the different institutional work that results in the distinct features of them.

### 4.2.1 Shared institutions between mobile design and clothing fashion

In the case of the emergence of fashion in mobile design, mobile design and fashion design overlap in the sense that they draw on shared institutions. Joint institutions that are engaged in the concrete interactions between the mobile industry and clothing fashion are especially indicative of the role of institutions, since the presence of fashion values in the design objects can then be understood as emerging out of institutional work in the production of said objects.

Our study shows that firstly, the institutional work in mobile companies takes the form of concrete activities in the daily routine of designers’ work, such as buy fashion magazines and trend books, read fashion blogs, go to fashion fairs or runway shows and talk to fashion experts. The mobile industry wants to stay close to the fashion industry to better understand how the fashion industry can seduce consumers, and hopes gain a bit of this effect just by being associated with it.

Secondly, the institutional work is socially constructed through coordination and synchronization among different actors. We focused on one particular case of convergence between fashion institutions and mobile design, namely, the use of shared trend agencies. There are basically two perspectives to understand fashion trends. First, trend analysis is a way to analyze where the world is going. It is an analytical process, often referred to as “research,” in which phenomena are dissected to achieve an aggregated understanding of their components (Brannon 2005: 68). The second perspective sees trend as constructed by social communities or organizations. A color palette is agreed upon at a meeting where specialists bring their own color boards to discuss with each other (Diane and Cassidy 2005: 31). If the trends are negotiated in a meeting, it is not far-fetched to characterize them as designed, or constructed, through concrete acts of communication and coordination. The fact that the mobile companies intentionally share the trend research with clothing fashion industry, rather than setting up their own trend agencies inside the design department, is to get a sense of fashion in their design, since they know that trend agencies have been creating fashion trends for a long time. Our interviews indicate that the reason why they are especially good at predicting trends might be precisely because they themselves construct the trends.

However, the institutional work in generating mobile fashion is marginalized by many other activities and values in mobile design. This makes incorporating fashion more complicated. First, there are stable aesthetic principles that do not have to do with trends, like the “Golden Ratio”. This refers to the inner logic through which a thing gains depth in expression. These aesthetic values have sometimes been summarized as principles for product design, such as contrast, symmetry, and harmony (Noble and Kumar 2010:645). Second, visual design should go together with technical solutions, which in a way restricts the limits of creativity in visual design. Finally, material technology constrains the color choice. Those concerns show that although institutionalized fashion values have some influence on mobile phone design, they have to compete with other values. This might explain why fashion is less visible in mobile phone design than in clothing. Furthermore, the interaction that leads to fashionable devices occurs not only between the mobile and clothing industries, but also between mobiles and other products, such as automobiles and interior design.

To sum up, the concrete interactions we found between mobile design and clothing fashion strengthen the argument that we are increasingly experiencing a diffusion of fashion values into other areas of product design. However, these influences follow complicated patterns, which reflect the underlying institutional work.

### 4.2.2 Mobile fashion as action nets

Since we follow the recent institutional account of fashion, i.e. Kawamura’s fashion-ology, it is then relevant to look at the research on institutions. Institutional theory generally studies the processes by which structures, including schemes, rules, norms, and routines, become established as authoritative guidelines for social behavior (Scott 2004). There are various perspectives within institutional theory.

Kawamura’s fashion-ology represents one type of the approach to study fashion, structural-functionalism. Kawamura argues it is “a system of institutions that produces the concept as well as the phenomenon/practice of fashion” (Kawamura 2005:1). Although she discusses interactions between individuals, her approach is mainly structural-functionalist, which suggests that institution has a unified purpose and its constituent elements derive their roles from the overall rationale of the system. The elements are conceived as “organisms” that work towards the proper functioning of the entire “body” of society (Urry 2000: 23). Developing sub-organizations is “the key factor in the process of institutionalizing” and building the fashion system (Kawamura 2005: 53). This is particular representative in the Parisian system. In fashion studies, critics have already claimed that the Paris-centric approach is too simplistic and they would add competing systems such as those in Tokyo or Milan (Skov 1996; Volonté 2012). Although those studies allow for more “parts,” it is still not well suited to account for the relation between mobile design and fashion.

There is also a constructionist view in institutional theory. Constructionism understands reality as socially constructed and contextually dependent (Berger and Luckmann 1991:15). It focuses on the concrete activities that sometimes make social interaction and technology look like functional machines (Latour 2010). In institutional studies, a constructionist view understands institutions or organizations as something heterogeneous and fluid that are constantly being made (Robichaud and Cooren 2013). A good example is sociologist Barbara Czarniawska’s action net theory. The concept of action nets aims to illuminate how collective actions are tested, repeated, or dropped in a process where actors make “connections” that either dissolve or are stabilized (Czarniawska 2008). Her “action nets” are intended to display the importance of particular situations, although they do not always develop into stable organizations.

The constructionist view of fashion has already existed in previous fashion literature. For example, Blumer argues that fashion is a result of “collective selection” and is socially produced by institutional, social, and cultural relations between a number of key players in the industry. Blaszczyk argues that fashion is a cultural phenomenon growing out of interactions between individuals and institutions (Blaszczyk 2009:10). They highlight the social construction where interactions among different actors lead to the production of fashion. We follow this direction and attempt to use institutional theory to explain the concrete connections between fashion and mobile design.

The interviews help us understand better what is happening in the mobile industry and the fashion industry. The dissemination of fashion into mobile design can be seen as emerging from shared social practices or institutional arrangements, such as color trend research. This helps us understand where and how the resemblances emerge. If trend research is a form of methodologically objective analysis, then its result depends on what is going on among consumers. The trend agency is then an important sub-system, which can be used to design both clothes and mobile phones. However, if we consider trend research as a form of construction that creates trends, we are looking at a social practice where things are molded, like how Kawamura explains the generation of fashion. Then the question is how to understand this particular form of social practice. It is not self-evident that those social practices can be understood as a hierarchical “system” which Kawamura proposes (Kawamura 2005).

Our study shows that the concept of “action nets” which highlights heterogeneity and flexibility, might be more appropriate to interpret the fashion produced in mobile design. With a much longer history, fashion design is based on more stable institutions, such as that of coordinating color selection; while the mobile industry is young and expansive with a foundation in engineering. The interviews show how organizational work within mobile phone companies interacts with ongoing fashion production in a more ad hoc way; and the interactions with fashion need to be balanced against other considerations such as functional and material requirements. Furthermore, the institutions of fashion seem to be already dependent on negotiations, such as when color trends are understood as formed and synchronized in meetings. Thus, mobile design, with its balancing acts, is linked to fashion design, which is also generated in situated constructions. With such a detailed and empirical perspective, it is hard to see a hierarchical “system”. Therefore, the concept of “action nets” by Barbara Czarniawska seems to be more appropriate. It sees organizations as assemblages of various forms of activities and interactions. Rather than focusing on what will eventually appear to be an independent institutional object, this constructionist view makes visible the actions that make this happen.

In all, the unsystematic character of this type of institutional work makes the discussion of similarities and differences from an institutional perspective more complicated. Institutional work that turns mobile phones into fashionable items are rather in the form of action-nets that blend with other actions, instead of being constrained by stable and hierarchical systems. The similarities and differences must be seen as embedded in heterogeneous and complex situations, which makes it even harder to decide whether we are witnessing a merging between fashion and mobile design.

## 4.3 Mobile phone in the fashion system (Paper III)

Previously we have addressed the question of how fashion emerges from mobile design by investigating the share institutional arrangements between the mobile industry and the fashion industry. It reveals that the mobile industry intends to make their products more fashionable by actively engaging in the established institutional activities in the fashion industry. Drawn from the fashion-ology theory, we continue investigating mobile phones in the diffusion part of fashion system.

We have studied online magazines and blogs, which could be seen as a new type of fashion gatekeeping mechanism, to explore how mobile phones are treated as fashionable items in the fashion system.

### 4.3.1 Online media put fashion into mobile phone

Online media is an appropriate place to investigate aesthetic interaction and digital computing. Our study shows that there is a link between the fashion system and mobile phones. First, the mobile industry invites people from fashion media to join the launch parties and test the new phones. Thus, mobile companies seem to treat fashionable gatekeepers as an important group of consumers. The fact that they give phones to the bloggers, in specific, shows how they are valued as gatekeepers between consumers and producers. Second, the language, by which online media discusses mobile phones, is rooted in the fashion world. It fits with Roland Barthes’ semiotic theory on the linguistic system of fashion. He argues that there are two ways of representing fashion i.e. a language of visual features and circumstanced appearance. This language is essential in making clothing and phones into fashionable items (Barthes 1983). When it is utilized to represent mobile phones, it adds to the possibility to adore these digital objects as well and shows another link between fashion and the mobile world. Our corpus shows that the language through which mobile phones are described overlaps with the lexicon of clothing fashion, such as elegant, chic, fashionable and sophisticated. These words are used to describe the aesthetic feelings in relation to the visual features of mobile phones. The descriptions are important in the sense of aestheticizing mobile phone as a fashion object. In this way, mobile phones are approached aesthetically almost in the same way as clothing.

The writers’ opinions on the mobile phones are not simply users’ evaluations of the technology, but are also loca­tions where phones are made to be fashionable items. We argue that these social practices, e.g. fashion writings and gatekeeping, are important to understand aesthetic interaction and how to design attractive interaction. They are part of the “environment” in Dewey’s theory (Dewey 2005). To be more precise, the design of attractiveness is to be found in other places than in hardware and software design centers. This is similar to the way fashion is created in a system, which extends the places than where the clothes are manufactured. In this case, mobile phones become adorned in and through online media.

### 4.3.2 Understanding experience with mobile phone in fashion practice

Since the pragmatist aesthetic theory has been predominant in the discussions of aesthetic interactions and experiences in HCI, we examine whether the theory could be applied to interpret fashion practices, which we see as common aesthetic experience in everyday life. Online fashion writings provide practically available empirical materials in an area where gathering data is usually very difficult, such as studying aesthetic experience. The gatekeepers enthusiastically write down their experiences of looking at a new fashionable phone or interacting with it. They use the same vocabulary as what they would use to describe fashionable clothing; hence the personal experiences are aesthetically transformed into words. Our study shows that the fashion experiences might not fit all the characteristics of an aesthetic experience proposed by Dewey.

First, in the discussions of aesthetic interaction in HCI, there is a tendency to focus on physical or bodily interaction, as a way to complementing visual expressions. This is drawn on Dewey’s claim that aesthetic experience depends on a balance of all senses (Dewey 2005). However, what we learn of users’ experiences in this area does not seem to fully support such an approach. The online fashion writers focus on visual features when they comment on the aesthetics of the mobile phones. They reveal and comment the stylish visual look. Thus, in many ways, the gatekeepers’ idea of aesthetics is a concern for its visual appearance than an interest in the appeal of physical and bodily interaction. Here, the aesthetics concerns the look of a device, not what is going on when the users input or output data.

Still, physical interaction does play an important role in the way our handling of the phone makes its visual appearance publicly available. Celebrities are mentioned when using their phones or posturing in public events. The way that phones are presented as parts of the “environment” makes the social and cultural discussions in aesthetic interaction visible. It puts mobile phones into a context and cultural background, which make them glamorous and desirable as fashion items. In this sense, it highlights some of the arguments from the pragmatist aesthetic theory. Although it also underscores that physical interaction is part of the aesthetical interaction, it is rather referred to as a means to support visual appearance. Thus, what we see here is an aesthetical interaction that is not sense balanced, but is very much devoted to the adornment of our eyes.

Second, Dewey and the pragmatists argue that aesthetical experiences should be harmonious (ibid), whereas the aesthetics of fashion is instead ambiguous and unstable. The gatekeepers emphasize the features of “new” and seasonal change of mobile phones they think as fashionable. This is one of the most important features for fashion. What’s fashionable today will not be fashionable tomorrow. Thus fashionable people are always somewhat uncertain and must look for the next desirable object. Old phones become replaced by new phones for many reasons such as when they go out of style or lack new functionality. We have seen how common temporal changing patterns within clothing fashion, such as “seasonal change”, come to be evoked as a need to change phones. At the same time, it is important to recognize the temporal differences, between how people change mobile phones and how they change their wardrobes. We change our phones and clothes on a temporal base, and we look for ways to combine these two types of commodities into ensembles or outfits. But the temporal variations differ which makes the combinatory work difficult and adds to the inherent ambiguities in this particular aesthetic practice.

In all, the way in which fashionable people relates to mobile digital devices provide interesting findings that make explicit certain limitations in the pragmatist approach to aesthetic interaction.

This chapter addresses the questions of whether and how aesthetization in general and fashion in particular occur and exert influences on mobile design. First, we investigate the visual trends of mobile phones in its short history by doing a periodization on the visual styles of Nokia phones. We learnt that there was an aesthetization of mobile design in history, but the interests to aesthetics differed over time. Then we focused on fashion and study its impacts on the mobile industry in general, not in a particular company. We address this issue through two studies. The first examined the concrete institutional arrangements between the fashion industry and the mobile industry. We find there are joint institutions to turn electronics into fashionable objects, such as trend research. We understand the institutional arrangements in fashionable technology as rather flexible action nets that integrate fashion values, norms and mechanism. The action nets of mobile fashion co-exist with more complex networks, which makes fashion less visible in mobile industry. The second study was to investigate how mobile phones become fashionable items through fashion gatekeeping. The language of clothing fashion is employed to make mobile phones fashionable. Visual aesthetics and temporal variations are emphasized. Moreover, fashion experience where digital technology is involved seems to underscore some points of pragmatist aesthetic theory but also undermine some characteristics of aesthetic experience that pragmatist aesthetic theory has argued.

# 5. Designing Fashionable Technology

This chapter deals with the question of how to design digital technology that could account for fashion mechanism and extend fashion’s impact. We will discuss the concept of “outfit-centric accessory”, introduce the two design exemplars and present the design implications from the explorations.

## 5.1 Conceptualizing “Outfit-centric Accessory” (Paper III)

The concept of “Outfit-centric” accessory is derived from the study of fashion editors and bloggers’ comments on mobile phones (Paper III). In that study, we find that the posts on mobile phones are few, which imply that something is missing in mobile design. Based on our empirical materials, we propose a design concept of “outfit-centric accessory” to approach how to design a digital device that accounts for fashion institutions. In fashion, an accessory is something that adds to the outfit, or the ensemble. It is often a watch, a bag, or piece of jewelry. We term this an “outfit-centric accessory” because it starts from the wearer of clothes. In this perspective, a mobile phone becomes an accessory that should be an integral part of the outfit. However, in the mobile industry, it is often the device that is the center of attention. The concept of “outfit-centric accessory” contains the following features:

First, the accessory should match the outfits of the wearers. In fashion practices, people create a whole look composed of different pieces. Thus they care about the aesthetic value of an ensemble of clothing items, not a single item. Similarly, if we design a mobile phone as fashion accessory, the phone should be able to provide a kind of aesthetics that matches the outfit of the wearer. This might be an interesting opportunity.

Second, the visual features of digital devices should be publicly available. This argument is grounded in the observation that the surface of a phone, which is a screen, is normally facing toward the user and invisible to people nearby. The back of a device is public to other people, but has a fixed color and shape, similar to garments and other fashion ob­jects. The study reveals that the visual interaction with the phones’ more concealed areas, such as the screen, was very seldom commented on in aesthetical terms. The fashion gatekeepers explicitly commented on how phones appear in public situations, such as runway shows. This is in line with fashion studies, since fashion is necessarily “public” (Reynolds 1968), and making visual features publicly available will be a critical problem if a user wants to make a fashionable statement with the phone.

Third, the public visual aesthetics should have temporal variations and cannot be stable all the time. **Fashionable people must consider the appeal of an object in relation to time and change.** Borrowed from fashion’s terminology, words of new “season” used to introduce a new mobile phone imply that this phone is “in” while the old ones are out. Fashion trend is traditionally released on the runway bi-annually, known as two seasons (spring/summer, autumn/winter) (Kawamura 2005). Here the mobile phone is placed within a similar temporal pattern. Both clothes and mobile devices become obsolete because they become out-of-style, which is often much sooner than they break or fall apart. However, there is a tension between the desire for variations when using a mobile device as a fashion accessory and the current role of our phones in dressing. At present, the ways to change the visual look of a phone are limited. When it comes to garments, variation can be easily done through switching in-between different clothing items. There can be many variations in terms of silhouette and style. We can change our outfits on a daily basis, but much less frequently in changing the look of our phones. This also explains why mobile devices are usually not something to consider in our everyday dressing practice.

The gatekeepers appreciate the above-mentioned features in fashionable phones and clothing. Their limited interests in mobile devices might be explained by the restricted opportunities to create and vary visual appearance on mobile phones. In sum, taking the considerations of matching ensemble and temporal variation together, we argue that the outfit-centric approach should provide mechanisms, which increase the turnaround of the impression of digital devices, and do it in such a way that it fits with a person’s ensemble. We believe that designing for this concept will increase the interests of fashion conscious people.

## 5.2. Design exemplars

The concept of “outfit-centric” accessory tells us there would be opportunities to design for public visual aesthetics that match an ensemble and adapt to the variations of looks when designing fashionable digital technology. We have made two design exemplars to further investigate the design idea.

### 5.2.1 Shape-switching device (Paper IV)

The first design exploration examined how to account for methods used by fashion to create items that people adore, in particular, how a garment is institutionalized into a fashion item e.g. through designer cults and design by style. It resulted in the concept of a shape-changing digital device, whose shape could be changed in twenty-two different ways to match various dressed ensemble. The shapes that the imaginary device could provide were presented as a series of twenty-two mock-up samples that are in themselves hard to the touch, which vary in color and shape (see Figure 5-1). Inspired by the soft fabric folds in the local fashion style, the design exercise points to what variations, based on organic interfaces, could potentially look like when applied to mobile design. Whereas stickers and covers also meet the demands of being publicly visible and being Prêt-à-porter, the exploration presented here goes a step further by using an approach specifically inspired by emergent technology, and grounded in a particular local dressing style.

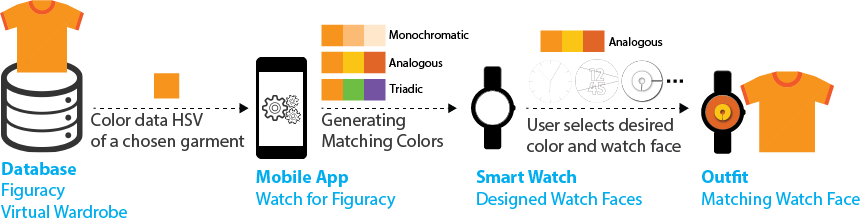
Figure 5-1 The 22 mock-ups that represent different shapes and colors within a “Shape-switching device”(photo by Rickard Sahlén)

### 5.2.2 “Watch for Figuracy” (Paper V)

The design exercise of the shape-changing device explores the possibility of new hardware for an “outfit-centric” design, inspired from the emerging organic interface technology. That was an investigation before we could actually look into the interaction side. After that, we continued to explore software that could account for fashion institutions or values, such as matching an outfit. This time, we focused on smart watches, which have become increasingly popular in the market of wearable devices. We built a smart watch application called “Watch for Figuracy” as an experimental prototype to design for the “outfit-centric” concept. This is a service that enables the users to choose a desired watch face and match its color with the clothes he/she is wearing.

Figure 5-2 The system of "Watch for Figuracy"

The implementation of color matching algorithms was selected to illustrate this potential. We chose to use color theory to develop algorithm in design. This was because: first, the use of color theory has been established as an institution or norm in fashionable dressing for a long time, dating back to two centuries ago (Nicklas 2014). Fashion writers of that period applied the color theory, e.g. “harmony” and “contrast” from the French color theorist M-E Chevreul, to everyday dressing decisions and gave advices on the combination of colors. Second, contemporary dressing, which is more complicated, requires even more knowledge of color combinations. It is widely seen in fashion media that color principles are used to teach readers how to combine different colors when dressing an outfit. The color theory provides rules for color groupings and the color wheel is the simplest illustration of the matching principles. This is an available and articulated aesthetical theory that describes how color matching should be done, which could be used for designing matching algorithms. Our “Watch for Figuracy” serves as an example for making smart watch applications by using the available color theory to build the algorithm. This is done through a mixed approach of combining hardware and software.

The system (Figure 5-2) can roughly be described as consisting of three components:

1) A database where the users’ clothes items are digitally represented and stored. We made use of an existing mobile application “Figuracy”. It is both an online website and a mobile application where the users create their virtual wardrobes by uploading information e.g. brand, color, size and photos of their favorite garments. The service was in this project extended with a way to select items that were currently used.

2) A controlling mobile app, by which the users can choose the clothing item they want the smart watch to match with and the desired watch face color from the colors proposed by the app via color matching principles and algorithm. Color matching principles usually have around seven to nine common categories, of which we choose three, including Monochromatic, Analogous, Triadic.

3) An output watch face that matches the wearer’s outfit, which the user can select from a set of designed watch faces. In all, it provides fashion “smartness” that is contextually dependent on the wearer’s current outfit.

## 5.3 Design implications

Through the two design exemplars, we have explored how to design fashionable technology that accounts for fashion mechanisms. In this section we discuss the learning of the specific instantiations from the following points:

### 5.3.1 Mobile fashion beyond hard covers and stickers

In mobile design, there have been explicit attempts to create designs that target a fashion-conscious market. The historical study on the style of Nokia phones discloses the ways of making a mobile phone fashionable from the perspective of design. “Fashion” in mobile phone design has been mostly displayed on hardware, e.g. the selection of colors, shapes, and materials used for different handsets. The materials that are commonly used in fashionable clothing items were used in mobile design, such as leather and fabric, as seen in the L’Amour collection; or precious materials such as crystal and gold, as seen in some limited versions of Nokia 8800. Apart from the phone, the most visible way in which the mobile design has approached fashion has been through cases, charms, stickers, shells, and other decorations (Katz and Sugiyama 2006). We have applied two approaches in the design instantiations to expand on the previous possibilities. The first exploration is to focus on the hardware of the digital devices while the second one attempts to combine the hardware and software. These approaches extend existing possibilities in the following ways:

First, we have a three-dimensional exploration in terms of hardware design, which moves beyond a rectangular device, and the variety of shapes offers greater diversity in appearance. This is driven by the critical restrictions on hardware that a current phone has and that make it difficult to support applications that fully embrace the concept of outfit-centric design. We got inspirations from the emergent technology of organic interface, which gives more freedom to experiment with public visual design. Regardless of the potential of this new material, this design exercise is still a step prior to exploring the actual functional shape-changing device.

The low-fi mock-ups in different shapes and sizes allow for experimentation with location on the body. This design exercise displays the outfit-centric concept that is inherent in the device, i.e. a mobile device that could change its shapes to match the outfits. This would allow for more extensive variation than selecting from hardware gadgets or accessories that are fixed in form and appearance. Most importantly, the exercise also reveals the potential to design applications that connect visual aesthetics of mobile devices to dress ensembles. For instance, the participants’ interests in color variation could be utilized in design solutions that do not support shape switching. Such an interest inspires us to do the second design exploration on smart watches.

Second, we develop the smart watch application “Watch for Figuracy” to investigate how to design software and services that could make variant public visual aesthetics for digital devices. This exploration not only concerns the temporal variation of visual appearance of a device, but also suggests that the variation could be driven by “intelligent” software that can detect the objects in the vicinity.

Fashion literature tells us that fashion is strongly motivated by an individual’s constant variation and change of clothing items, in combination with a continuous chase of news value. This leads to a wide variation of an individual’s visual appearance. In this design exercise, we focused on the role of watch in the matching practices. Currently, visual variation of an analogue wristwatch is mainly driven by changing a whole new watch or a different strap. A smart watch has additional potentials to provide more variations on the face, as it has a screen rather than a hard watch face. Moreover, Android Wear also provides the opportunity to manually change between pre-designed watch faces. Our application extends these opportunities by making the smart watch adapt to the current outfit and by using the available color theory to build the algorithm. Thus the visual output on the screen, is controlled by a software service. Of course, making the watch display visible to the public all the time is challenging. Although this prototype can only display the color when the watch is turned on, this problem will be likely to be solved in the future when innovative material is used, e.g. color e-ink.

In all, our design instantiations provide new opportunities of making increasing variations of public visual aesthetics for digital technology.

### 5.3.2 Designers and styles

Our design explorations not only emphasize the role of designers that could provide legitimized options for consumers, but also call for a more extensive collaboration between HCI and fashion design.

First, in the exploration of the “shape-switching” device, we are particularly interested in the styles and collections that fashion designers create. Here we focus on Prêt-à-porter, or ready-to-wear, which means clothing fabricated for mass distribution and consumption (Mazza and Alvarez 2000). In fashion studies, it is widely accepted that garments and accessories for the most part are not made by consumers, but bought in stores (Wilson 2003). Prêt-à-porter, designed by fashion designers, displays a large variety of styles. Fashion historian Valerie Steele states that the empire of fashion has fragmented into hundreds of competing looks (Steele 2000). Fashionable people choose to be in different style tribes, epitomized by different fashion labels, such as The Modernists, e.g. as represented by, Jil Sander; The Rebels as represented by Alexander McQueen; The Romantics as represented by John Galliano (ibid).

The idea of a “shape-switching” device was visualized into a set of low-fi mock-ups. Their visual appearance was inspired by the local style in Sweden, which emphasizes the visual aesthetics as a local and historically dependent style. The Swedish style is minimalistic, clean, streamlined, and jeans oriented (Falck 2011). Moreover, it is characterized by monochrome colors, with most items in grey, black, beige, and denim blue (ibid). The twenty-two mock-ups represent the different visual presentations within one device. Ideally, the interaction is provided by an organic interface, which might give an infinite number of possibilities for switching shapes. Still, we decided to provide only a limited number of shapes, which is aligned with fashion logics, i.e. designers’ seasonal collections. The designer’s expertise therefore plays a specific role in this exploration: to investigate a matching mechanism that restricts users’ possibilities, following the tradition in fashion where people buy Prêt-à-porter from stores, instead of making clothes themselves (Wilson 2003). The user gets to choose the appearance of the device from limited options provided by a designer.

Second, the exploration of “Watch for Figuracy” investigates designing fashion services that could make variations in visual aesthetics and calls for further collaboration between the interaction designer and fashion designer. If we understand design as some sort of thinking or institutional work, designing fashionable technology seems to be able to be done by any designer. However, we should be aware that fashion design is nested into a series of institutional arrangements that may have been established for a long time, thus it is necessary to consider the fashion values and norms if we aim to design fashionable technology. To tackle concrete problems and take advantage of their expertise in different areas, it might be best to have more extensive collaborations between HCI and fashion design.

In sum, our design instantiations emphasize the role of designers and the employment of institutions. We also call for a more extensive collaboration between fashion designers and interaction designers to create fashionable technology.

### 5.3.3 The social context of fashion aesthetics

Aesthetics in fashion practices are visual dominant. The visual presentation of an individual is not just a reflection of his inner self, but more importantly, a silent interface that one could speak to the world. Fashionable dressing is rather a performance that concerns the activity of an individual marked by his continuous presence in front of observers and which has some influence on the observers (Goffman 1990/1959:13).

The concept of “outfit-centric accessory” provides the design principle that focuses on the artifact as being visible to others, and as part of an ensemble. Our attention was therefore directed towards visible features such as shapes and color, to be seen at a glance. In the design case of “shape-switching” device, the user study shows that our participants’ adherence to the same principles was perhaps most apparent in the attention they paid to the placement of the design items on the body. The samples were presented as necklaces, brooches, a ring and a small bag, etc. (Appendix 1). The possibility to change the position of the mock-ups on the body and its importance, were not pre-conceived in the design, and we were surprised by the creativity. These forms of use offer different amounts of visibility in social encounters, as well as setting the items in different contexts, e.g. next to the trousers when used as a belt and next to a blouse when used as a necklace. The participants also linked the visual forms of the mock-ups to social occasions, such as the more wrinkled shape, which looks more fun, was considered to be suitable for a party. The participants’ experiments show that public visibility is a relevant concern among these fashion-conscious participants, and that our samples can serve to meet that demand.

The design of “Watch for Figuracy” also emphasizes the importance of public visual aesthetics. Fashionable people are interested in the “backside” of a mobile phone instead of the screen on the “front” side since that is where it could display public visual statement. However, a smart watch provides a platform that has a public visible screen. Thus it has huge potentials to provide limitless visual expressions. The screen is in the hybrid design space between fashion and “mobile technology”, where this study shows both potentials and challenges. In our initial user feedback study, the participants showed strong interests in the idea of making the watch face change according to what they wear (Appendix 2). But they also expressed concerns in terms of the concrete interactions with the application. They seemed to prefer the monochrome color principle, which might indicate that they tended to follow the color selection they had already used in their daily dressing. Thus, in these cases they did not prefer the “fashion intelligence” provided by the app. Meanwhile they also selected the analogue and triadic mechanism, which showed an interest in such new abilities. In all, the participants for the user study both rejected and accepted the hybrid suggestion.

Moreover, public visual aesthetics indicates a desire to be individual and a member of a group, which typically represents fashion’s ambiguity. Reflecting in interaction design, the ambiguity implies that it is not enough to use customization as a way to evoke endless personification; designs should also account for social conformity, such as institutions, which will formulate common grounds for a community. The shape-switching design emphasizes the role of designers and the concept of ready-to-wear in the fashion industry, which provides an example to access to the fashion institutions. “Watch for Figuracy” application uses three color principles as a kind of computational institutionalized fashion rules. The software provides fashion intelligence that allows users to follow. Although we recognize that fashion practices have to do with more than just the sense of sight, our user studies of the design exemplars tend to emphasize the properties that can be shared with others, i.e. the publicly visible appearance.

### 5.3.4 Designing for variations in dressing practices

Fashion-conscious people are part of a culture, which thrives on continuous change and transformation (Wan et al. 2001). In particular, the concept of outfit-centric design grew out of the identification of a difference between how often we change items of clothing and digital devices. People change their outfits on a daily basis and add new garments to their wardrobes more often than they change their mobile phones. Being in line with the observations in clothing fashion, our concept of “outfit-centric accessory” requires the visual aesthetics of digital technology to adapt to the temporal variation of outfits. Both of our design exemplars aim to provide increasing variations of visual expressions, but with different approaches.

The “shape-switching” device offers a collection of designer’s shapes to match different outfits. The variations exist in the color, textile and shape of the imagined device, as well as its location on human bodies. Our user study shows that the temporal variation can be of different kinds. First, there are daily changes depending on context of use, e.g. working at an office or going to a party. The participants varied the shapes of the items in a way that matched how they changed the outfits. Second, the variation depends on the range of shapes available, similar to the number of clothing items of a particular type in the wardrobes. The way in which our participants varied their choice of clothes and accessories was not the same for every item. The range of variation is then influenced by how we perceive the shapes. This suggests that the range of variation would be smaller if it is perceived as a bag than if it is perceived as a shirt.

The smart watch application “Watch for Figuracy” focuses on the color matching of a watch face. The visual variations of the hardware are enabled by “smart” software that responds to the clothes people are wearing. The application applies color principles to generate algorithm and provides three color combinations for each color picked on a photo. This is combined with three designed watch faces that could present a set of colors, instead of a single color. This could increase the visual variations of the watch face. Its ability to make variations seems to be even more strengthened when the face needs to match a clothing item that has a variety of colors itself. Our user study shows that some participants manually picked the color from the small part of a garment, such as the pattern, to be matched. In this case, one could select various colors existing in one garment to be matched. Thus, this approach could not only increase the variations of watch face according to the change of clothes, but also offer variations of visual presentation to match a single item.

This chapter presents the design concept of outfit-centric accessory, two design exemplars and the implications generating out of them. Through making concrete instantiations, we explore the ways of using fashion institutions to influence mobile design. We particularly focused on the idea of making digital devices as part of an ensemble and match the clothing items. The two design explorations include futuristic hardware for a new mobile device and an “intelligent” wearable device that combined hardware and software, showing both opportunities and challenges of integrating fashion and interaction design.

# 6. Discussion

In chapter 4 and 5 we presented the results from five studies. They investigate the questions of how aesthetization and fashionalization occur in the design of digital technology, as well as how to design digital technology that accounts for extended fashion impacts. This chapter further discusses the key findings and implications for HCI. This includes understanding the role of aesthetics, especially visual aesthetics in our experiencing of digital technology, as well as unpacking the concrete relations between fashion and the design of digital technology. Finally it includes discussing implications of designing for “Tech Fashion”.

## 6.1 Pragmatist aesthetic theory revisited

The role of aesthetization in our everyday life has become increasingly important. The discussion of “aesthetization in everyday life” not only concern contemporary sociology and philosophy, but has also influenced the field of HCI. Although there have been different views of understanding aesthetics, pragmatist aesthetics has becoming much more influential than others. We here focus on this theory to discuss how we should study aesthetic experience in everyday life.

Recently, HCI researchers intend to shift the focus of aesthetics from the analytic tradition in HCI to a pragmatist perspective of aesthetics. The former view, as represented in “beauty in the mind”, treats humans “as disembodied processors able to construct independent realities in the mind”, and the latter, on the other hand, emphasizes, “how people experience the world dialogically as embodied subjects”(Fiore et al. 2005: 129). Pragmatist aesthetic theory is proposed as an alternative way to understand aesthetics. We certainly recognize the contributions that pragmatist aesthetic theory has offered to the discussions. However, we question how such a rather constrained philosophical formula could bring continuously growing insights to the field of interaction design.

Pragmatist aesthetic theory focuses on everyday aesthetic experience. Fashion practices, such as putting on a fashionable garment, are one type of aesthetic experience that ubiquitously exists in our everyday life. Thus we chose to study this kind of practices to investigate how we should understand everyday aesthetics. Fashion practices are aesthetical, because all the activities in these practices are leading to certain aesthetic ideals for human bodies, such as beauty, elegance, sexiness or glamour etc. In specific, we study fashion bloggers’ writings and dressing practices. According to the empirical studies, fashion experiences may not have all the qualities of aesthetic experience listed by Dewey.

First, Dewey’s aesthetic theory lays strong emphasis on understanding aesthetic experience in the interaction between human being and the aspects of the world in which the person lives (Dewey 2005: 45). According to him, in order to understand aesthetic experience, we need to account for “environment” in which it occurs and the ways in which we interact with it (Dewey 2005). Our study of online fashion media (Paper III) emphasizes the importance of environment, in line with Dewey’s suggestions. Mobile phones become fashionable when they are situated in a fashionable context, such as in a fancy launch party, in fashion catwalks or in a hand of a gorgeous celebrity. Here, the bloggers take an interest in the aesthetics of a social context, i.e. where it is seen and who is using it. Furthermore, fashion media uses a specific vocabulary to fashionalize mobile phones. We found two types of such language in the empirical materials, i.e. descriptions of both the appearance of mobile phones and the fashionable circumstances, which is in line with Barthes discusses on the linguistic system of fashion (1983). When fashion vocabulary is utilized to represent mobile phones, it adds the possibility to adore these digital objects for readers and shows another link between fashion and the mobile world. In this way, the writings on the mobile phones are not simply users’ evaluations of the technology, but rather loca­tions or cultural contexts where phones are made to be fashionable items. They are part of what Dewey would refer to as the “environment”, from which aesthetics emerges.

Second, Dewey emphasizes the abstract qualities of “inner” experience that lead to an idealized harmony. Such an experience has to be unified, continuous, ordered, harmonious and complete. The experience possesses internal integration and fulfillment reached through ordered and organized movement, which can lead to satisfying emotions (Dewey 2005: 38). Order is particularly emphasized here, which emerges out of complexity to become something harmonious (ibid: 13). Our empirical data shows that many aesthetic experiences, which are related to the appeal of clothing, are not harmonious and balanced. For instance, the online fashion media study highlights the temporal ambiguity, which emerges out of constant changes. Fashionable people seem to hardly get a feeling of harmony, since they are always chasing for the next desirable object. Aligning the mechanisms of fashion desires, with the use of mobile phones, seems to add another object to the list of disordered considerations in fashion, as fashionable clothing items and mobile devices have different paces in temporal variation.

Third, Dewey’s aesthetic experience highlights the balanced sensuous feelings, including not only visual, but also all other feelings coming out of five senses. This idea drives the research of “aesthetic interaction” in HCI, which focuses much on bodily interaction and touch senses. However, according to our study on fashion experiences, this type of aesthetic experience tends to be visual dominant. For instance, the study on online fashion media shows that comments on the visual features of the phones are the most recurrent topic in the empirical data. Fashion writers reveal and enthusiastically comment the stylish visual looks of mobile phones, such as their colors, material and forms. Physical interaction sometimes plays an important role when it becomes a means to support the visual appearance of mobile phones. The way they comment on it is not on par with the way they discuss visual aesthetics. Thus, such an aesthetic interaction is not balanced, but is much devoted to the adornment of our eyes.

Therefore, the fashion experiences we analyzed do not seem to match Dewey’s pragmatist aesthetic experience very well. In fact, there has already been a debate within pragmatist philosophy. Shusterman (2000) argues that much art fails to generate Dewey’s aesthetic experience. He also thinks that the aesthetic experience that is fragmented and ruptured, contrary to Dewey’s emphasis on harmonious and unity, is of value (Shusterman 2004).

This discussion leaves us in an awkward position. The gap between the conceptualization of aesthetics in pragmatist theory, and the ways in which aesthetics is of importance in fashion practices, calls for revisiting the foundations of current discussion on aesthetic experience within HCI. To us it seems that many of the ordinary experiences of which he speaks, which for us should include the appeal of clothing, are not as complete and balanced as argued in this theory. Beyond the empirical analysis in our thesis, there are more examples in fashionable dressing that point to the fragmented, inharmonious and imbalanced experiences. For instance, high-heeled shoes cause pains but still offer aesthetic fulfillment. “Bricolage” in dressing de-constructs the designers’ united runway looks. The sloppy and asymmetric Japanese style brings wearers the enjoyment of being rebellious against the norm of harmonious beauty, etc. Of course, if we rule out those sides of fashion as aesthetic experience, it is possible that pragmatist aesthetics is still relevant. Since it is still obscure to define what exactly means by “aesthetic experience” in Dewey’s theory, its value on the discussions of aesthetics in HCI might be limited.

The other possibility is to see Dewey’s philosophy as a source of inspiration to open for studies of ongoing and naturally occurring aesthetic practices in the world, but transcend his set of specific guidelines. McCarthy and Wright have made initial efforts in their book *Technology as Experience* (2007) to change the traditional view of technology in the field of human computer interaction by using pragmatist aesthetics. They propose to see technology as in “lived and felt experience”. They value much on Dewey’s theory of everyday aesthetic experience, but they also use another scholar, Bakhtin’s theory to complement Dewey’s. Dewey proposes a holistic unity, which is an idealized vision, while Bakhtin “resists to reifying any social structures” and focuses on “particular moment” in “small personal lives”(McCarthy and Wright 2007: 57). The combinational view indicates that they find Dewey valuable at some points, but not enough to explain everything.

We suggest that focusing on pragmatist philosophy might be of limited value for design-oriented research. The key book on pragmatist aesthetics *Art as Experience* has been dismissed as a “hodgepodge of conflicting methods and undisciplined speculations” (Isenberg 1950/1987: 128). Dewey makes argument or reasoning without grounding them in concrete empirical material. It is also criticized that the aesthetic experience in pragmatism is so “evanescent and discursively elusive” that could hardly define or analyze (Shusterman 2000). Thus, when it comes to design-oriented research, the use of such philosophical approaches might be less beneficial in generating concrete design ideas. Therefore, we might be better off with taking a closer look at what is going on in ordinary people’s lives, instead of pursuing “useless and confused metaphysical phantom” even further (Shusterman 2000).

## 6.2 Proposing “Tech Fashion”

Previous studies in HCI treat fashion in digital devices as either equal to garment, or particular individual experience of objects, such as identity construction and personal expression. This thesis offers new insights of fashion for HCI research. We emphasize that fashion provides a unique way to make something desirable.

Drawn on the fashion-ology theory (Kawamura 2005), we understand fashion as being different from clothing, as institutional arrangements that turn objects to fashionable items. Thus our task is to find the institutions in mobile design that are shared with fashion design, since those are very likely to be where fashion is generated in mobile design. The enquiry of investigating the impacts of fashion institutions in mobile design is not arbitrary, but built upon a study of mobile design as a case of “aesthetization of everyday life”.

Previous studies on such a topic tend to be generative and abstract. Our study focuses on aesthetization within a specific type of object and provides rich empirical materials, adding additional weight to the discussions. Paper I demonstrates that there was an aesthetization of mobile design in history. It was sometimes strongly influenced by clothing fashion trends. However, the aesthetization is unstable and inconsistent and so are the fashion’s influences. The study shows that piggybacking on the fashion industry has been a strategy in the mobile industry during specific times and has strongly fueled the aesthetization of mobile design. This connection to fashion is not a coincidence. A style in fashion, be it heterogeneous or homogeneous, is constructed and shaped by social and institutional arrangements (Kawamura 2005). Moreover, the fashion industry has rich experience of creating beauty and promoting new styles. The rapid variation in styles indicates that stable and universal aesthetic principles are less applicable than relational aesthetics. This can help explain that relational aesthetics, which sees beauty as social constructs (Dickie 1997), is more appropriate in accounting for the increased variation of mobile phones. This study not only provides empirical analysis of mobile design to discuss “aesthetization of everyday life”, but also directs us toward further studying fashion’s impacts on mobile design.

As a next step, we investigate the impacts of fashion institutions on mobile design. Our interviews identify an orientation toward the specific design values in mobile design, which are also very important in clothing fashion. These values include increased beautification of objects, creation of desire, and increasing variation through frequent product releases. These concrete observations strengthen the argument that fashion is leaking into a wider range of domains and also motivate moving beyond the identification of industrial resemblance.

From an institutional perspective, mobile design and fashion design differ because they rely on different institutional arrangements. But they also overlap in the sense that they draw on shared institutions. Joint institutions that are engaged in the concrete interactions between the mobile industry and the clothing fashion are especially indicative of the role of institutions, since the presence of fashion values in the design objects can then be understood as emerging out of institutional work in the production of said objects. According to institutional theory, institutions include schemes, rules, norms, and routines etc., which become established as authoritative guidelines for social behavior (Scott 2004). Fashion institutions could then be understood as the rules, norms or mechanism that become authoritative guidelines for fashion design and practices. Our study shows that it is through the shared institutional work that clothing fashion exerts influence on the aesthetics of mobile design. These institutions take the form of concrete activities in the daily routine of designers’ work.

At the same time, the results of our study also make us hesitate to draw the generalized conclusion, since it reveals the non-existence of stable institutional “sub-systems”. It also shows the heterogeneous and ad hoc character of the interaction between the mobile industry and the fashion industry. It is more complicated than simply saying fashion exists in all things, since the ways it appears and emerges in various domains seem to be very different. For instance, clothing fashion could have a hierarchical and structural system while fashion in technology-oriented industry exists in a more dynamic action net. It might be that the design of digital devices interacts with fashion in particular situations and the interactions vary over time. Fashion comes and goes from one product to another, and from one period to another.

Here we propose a “Tech Fashion” to understand the dynamic and concrete interactions during fashion institutionalization in the design of digital technology. This is distinguished from Kawamura’s fashion-ology, which is a hierarchical and machine-like system represented by how fashion traditionally is organized in and around Paris. We understand the institutional arrangements in fashionable technology as rather complex and dynamic action nets where individual fashion values and mechanism are flexibly integrated. The action net of fashion has to co-exist with other action nets where different actors and organizations are involved. This multiplicity of action nets makes fashion less visible in technology than in clothing.

Tech Fashion can be summarized as flexible and dynamic action nets, where fashion institutions are selectively used and integrated. It opens up new opportunities and makes possible deeper interactions between the two industries. Fashion should not just be the beautiful shells or additional ornaments of digital devices, but should have deeper influences on the design of digital technology. The concept is constructed to highlight the complexities of fashion production and call for studying the fashion institutions that could be integrated into the design of digital technology. This should not be misinterpreted as randomly selecting a single value and then superficially adding it to the action net, just because of its flexibility. In all, Tech Fashion offers new perspectives of fashion for the field of HCI, such as to explore what fashion institutions could be integrated into the action nets of designing digital technology or what actors, whether they are organizations or individuals, could be teamed up to fashionalize the design.

## 6.3 Designing for “Tech Fashion”

“Tech Fashion” is proposed as a new design space for designing fashion oriented digital technology. It emphasizes the dynamic institutional arrangements that could make digital devices fashionable. Designing for “Tech Fashion” means that designing digital technology that is fashionable and desirable needs and take into account the institutional arrangements embedded in the fashion industry.

Previous studies on aesthetics in HCI reveal many insights. For example, technology is not just a useful tool, but something embedded in our social life and something meaningful to us. Indeed, technology has been developing rapidly lately. People are now demanding more than simply “technology”. They care about aesthetics of the devices, which obviously includes its visual appearance. The interests in visual aesthetics are likely to increase in our experience of digital devices, especially wearable technology. These devices are increasingly worn on our bodies in ways similar to clothing. The screens of devices are no longer located in the private territory, but become part of the public presentation of ourselves. Such a change in position makes fashion more significant for designing these devices, since fashion has a long history in creating beautiful and desirable items for people to wear and to show off in public.

Previous studies in HCI understand fashion as symbolic meanings and personal expression in fashion consumption, the importance of appearance, or fashion as something made of fabric. These views have shown a relatively narrow understanding of fashion. First, the visual appearance and their meanings have already been an important part in industrial design (Bonsiepe 1962). It is not clear how fashion’s contribution differs from that of industrial design in studies of technology. Second, in wearable computing, fashion is mostly used equal to clothing or fabric, which is rather shallow. There are many so-called fashionable wearables that actually just make computers in the form of clothing or accessories. Those researchers and designers ignore that although fashion usually takes the form of clothing items, it is not any clothing that can be called fashion. In this thesis, we treat fashion as institutional arrangements that turn something to be beautiful, fashionable and stylish. Using such a view to understand fashion allows us to go beyond physical clothing, but to take into account fashion institutions, such as established fashion values and norms.

We focus on designing mobile phones and wearable devices, to account for fashion mechanisms. We study fashion gatekeepers to explore what features are emphasized when mobile phones are treated as fashionable items. Our empirical materials collected from online fashion media show a limited number of posts on mobile devices, indicating that something is missing in mobile design. Based on the analysis of empirical materials, we propose a concept of “outfit-centric accessory” as an attempt to design digital devices that account for a few important institutionalized norms in fashion practices, such as public visual aesthetics, matching an outfit and adapting to the variation of the styles. We argue that designing digital devices as “outfit-centric accessory” would gain more interests among fashion conscious people.

We have done two design explorations to investigate this idea. One is a series of mock-ups to represent an imagined “shape-switching” device; the other is a smart watch application called “Watch for Figuracy”. With the two design cases, we explore the possible solutions for the “outfit-centric accessory” designs. We investigate different approaches to reach the goal, including both the hardware design with emerging technology and a combination of hardware and software design. From mobile phones to wearable technology, our computer interfaces and garments are literarily touching on each other through the introduction of technology that we wear on our bodies. This orientation demands more collaboration between fashion designers and interaction designers.

Although both fashion design and interaction design belong to “design”, they have different orientations. Fashion design focuses on aesthetics, creativity and innovation in the domain of appearance, while interaction design emphasizes problem solving. Moreover, fashion design is nested into institutional arrangements that in its whole create desire, beautification and variation. This is different from other types of design, such as interaction design that uses a user-centered method to frame problems. Fashion design, which has a long tradition, is based on rather stable organizations, such as trend agencies in coordinating color selection. Therefore, in order to generate fashionable wearables and supporting software, we need to link design to both fashion thinking and its specific supporting institutions.

Furthermore, designing digital technology in consideration of fashion institutions or mechanism indicates an alternative method to the trend of promoting customization to reflect personality in interaction design. It requires that we follow others instead of always following ourselves. This has much to do with the ambiguity of the fashion phenomenon. On the one hand, fashion expresses uniqueness and personality; on the other hand, fashion also shows our desire to belong to a social community or conform to social institutions (Wilson 2003). This becomes a challenge for the design of fashionable wearables, since it indicates that the design needs to account for both sides in fashion. It is important that fashion design is embedded in institutional arrangements that create desire, beautification, and variation. Therefore, both the differences between the two types of design and the ambiguity of fashion require to account for fashion thinking and its specific supporting institutions in the design of fashionable technology. Hence, our design exemplars such as “Watch for Figuracy” allow users to not only personalize their watch faces, but also have it following the visual aesthetics of their clothes, which is influenced by fashion design.

The ambivalence of fashion needs further recognition in HCI, where it is often considered a hallmark in interaction design to allow and support personalization i.e. to allow users’ control of the presentation of the interface. Recent studies, such as Marathe and Sundar’s (2011), also show that customization might not help enhancing a sense of control if the users do not feel a connection with the interface (ibid: 788). They argue that instead of simply deploying the coolest new customization features, we should ask questions like “what does customization fundamentally entail?” “What are users experiencing when they change interface features?”(ibid) Hence it is not customizable interactive features that will certainly lead to users’ satisfaction. In our case, an orientation toward fashion implies a need to account for users’ demands to follow others and reject their individuality.

In chasing the design for fashion that is always looking for novelty and change, we need to generate new software for fashionable wearables to investigate and articulate more extended ways of accounting for institutionalized values or norms in the future, such as matching based on brands, tactility and patterns, as well as the principles that are in line with tomorrow’s fashion. The quest for fashionable wearables needs new technical offers, which could come from computational technology where the change is much higher than innovation in clothing technology. This requires more extensive collaboration between HCI and fashion design.

In sum, designing for “Tech Fashion” opens a new design space both in terms of emerging technology and social institutions. It is time to unpack how to combine these areas of design in order to create desirable technology.

# 7. Conclusion

This thesis explores how aesthetics in general and fashion in particular occur in the design of digital technology. Our interests in the aesthetics of digital technology are deprived from both the increasing discussions on the topic of “aesthetization of everyday life” in contemporary sociology and the growing research on aesthetic experience in the field of human computer interaction. We understand aesthetics as in the view of “beauty in relations”, which sees beauty as socially constructed, e.g. by people who have the expertise of making it. Drawing on some scholars in sociology and design research, increased visual variation could be considered as a crucial feature for aesthetization. To investigate the aesthetics of digital technology, fashion is focused on as a way to approach that, as fashion lays great emphasis on aesthetics. Moreover, digital technology’s shared positions with clothing and accessories drive us to examine fashion in digital technology.

Previous studies on fashion in mobile technology focus on the mobile devices in fashion consumption. However, institutional fashion theory tells us that it is a whole set of activities, including production, diffusion and consumption, that turn clothing into fashion. In this way, fashion is generated not only through individual’s mind in consumption, but also by social activities in production. Thus we here investigate fashion in the design side of digital technology.

To examine these issues, we apply an associative design approach, which combine and recombine different materials, such as empirical studies, design prototypes, available technology and theories, to inform new design spaces. Our results support that there was an aesthetization in mobile design, but more importantly, they reveal many complexities when we address this issue. There is no ongoing aesthetization in mobile design. Instead, it has ups and downs. An increasing aesthetization links to an increasing connection to fashion in mobile design, such as the Grand period in Nokia design history.

When we further investigate the emergence of fashion in mobile design, we find that there are concrete connections between the fashion industry and the mobile industry. These connections, which reveal the institutional arrangements that turn mobile phones into fashionable items, are best understood as action nets, instead of a structure-functional system. “Tech Fashion” is proposed as a concept to describe flexible and dynamic action nets of institutional arrangements that make digital technology fashionable and desirable.

The thesis also provides concrete design cases to explore how to design new mobile and wearable devices that account for “Tech Fashion”, e.g. institutionalized fashion values. Designing fashionable technology does not mean making beautiful shells, attaching ornaments or making computers in the form of clothing items as existing approaches of understanding fashion in HCI show, but should consider fashion thinking and institutions. It could be approached through a combination of hardware and software. Importantly, thinking of fashion in the institutional relations requires HCI researchers to recognize the ambiguity in fashion, such as the importance of social belonging, which is seen in fashion institutions’ regulations of people’s values and ideas on fashion. It is then a challenge to balance the individuality and institutionalization, instead of calling for limitless self-expressions as a way to make sense of technology. In all, we believe that HCI researchers could benefit from studying fashion to gain insights on how to make digital technology desirable and have fashion “smartness”. Thus we call for a more extensive collaboration between fashion design and interaction design.

# 8. Summary of Papers

In this final chapter we briefly summarize the publications that are included in this thesis and those that are relevant to it. In all, two papers have been published and two articles are in the procedure of publishing. The fifth paper is in submission. The first and second papers aim to investigate the aesthetization and fashionalization emerged in mobile design and how they occur in the design process. The third study explores how mobile devices are institutionalized to be fashionable items through gatekeeping practices and frames a concrete design concept. The fourth and fifth papers present concrete design exemplars, which we use to explore the new design space at the intersection of institutional fashion and digital technology. In the following, we present the abstract of each paper, along with a note on this author’s contribution to the work reported.

## 8.1. Paper I: The life and death of great Finnish fashion phones- A historical periodization of changing style in Nokia phone design between 1992 and 2013

Zhang, Yanqing and Juhlin, Oskar (2016) The Life and Death of Great Finnish Fashion Phones- A Historical Periodization of Changing Style in Nokia Phone Design between 1992 and 2013, in *Journal of Mobile Media & Communication.* Forthcoming

This article investigates whether an aesthetization of mobile design is taking place and, if so, how it is being pursued through institutional practices in organizations. We conduct a visual analysis of all Nokia phone releases between 1992 and 2013 complemented by an interview series with key actors. The study reveals a continuous increase in aesthetic variation between 1998 and 2008 and a decrease between 2009 and 2013. The interviews reveal how the visual design was driven by organizational strategies and an orientation toward the fashion industry. The study reveals how aesthetic variation is weaved into a complex innovation system with sometimes conflicting demands deriving from e.g. technology and use interaction.

The empirical materials, including online corpus and interviews of the five key persons in Nokia company, were collected and analyzed by the first author. Both the authors share the formulation of arguments and paper writing.

## 8.2. Paper II: Fashion in mobile phone design– The emergence of beautification, desirability and variation through institutional collaboration

Zhang, Yanqing and Juhlin, Oskar (2016) Fashion in Mobile Phone Design– The Emergence of Beautification, Desirability and Variation through Institutional Collaboration, in *Fashion Practice: The Journal of Design, Creative Process & the Fashion Industry,* Volume 8, Issue 1, pp. 63–84

This study investigates if and how fashion values, such as beautification, desirability through symbolic interaction, and high variation, are increasingly visible in mobile phone design. We unpack such possible inter-linkages by interviewing eight representatives of both industries. Our findings indicate that fashion values are visible in the design of mobile phones and are accounted for in design. Fashionalization can thus be seen as emanating from institutions related to clothing that extend to and become shared with the mobile industry. This interaction, ad hoc and heterogeneous, resists being modeled as a “system,” which has been suggested as a way to explain institutional work within clothing fashion. Drawing on Barbara Czarniawska’s institutional theory, we propose conceptualizing the emerging institutional work in terms of “action nets.”

In this study, the authors share the conduction of interviews, analysis of the empirical materials as well as paper writing.

## 8.3. Paper III. Unpacking Social Interaction that Make us Adore- On the Aesthetics of Mobile Phones as Fashion Items

Juhlin, Oskar, and Zhang, Yanqing (2011) Unpacking Social Interaction that Make us Adore- On the Aesthetics of Mobile Phones as Fashion Items, in *Proceedings of ACM Mobile HCI 2011*, ACM, New York, USA, pp.241–250.

We report on a study of fashionable people’s expressions of opinions on mobile phones in online fashion media, such as blogs and magazines. First, the study contributes to our understanding of the role of pragmatic philosophy, which is now dominating HCI both as a guide for design and as a guide when looking at social practices, in outlining the role of aesthetics in experience design. Fashion practices diverge from this theory, since here aesthetic appearance can be visual, ambiguous and incomplete although it still provides a lot of meanings for people. We argue that our findings should influence the discussion in HCI to consider a less theoretically oriented aesthetic approach, where instead empirical studies get at the forefront. Second, the study provides valuable insight on how we should design mobile experiences to attract more attention from people interested in fashion. Mobile phones, and their services, can for example be designed to relate to the visual appearance of the dressed outfit, or ensemble of a person.

The authors were listed in alphabetic order. The second author contributes much to data collection and analysis. Conceptualization of findings and writing were shared between the two authors.

## 8.4. Paper IV: Fashionable shape switching: Explorations in Outfit-centric design

Juhlin, O., Zhang, Y., Sundbom C. and Fernaeus Y. (2013) Fashionable shape switching: Explorations in Outfit-centric design, in *Proceedings of CHI 2013*, ACM, New York, USA, pp.1353–1362.

We present a design exercise illustrating how fashion practices and the fashion design process can be used to create new opportunities both in the mobile domain and in product design, as well as in wearable computing. We investigate the concept of outfit-centric design by extending the support for social and visual interaction with digital devices beyond the currently available shells and stickers, and drawing on the ways in which people vary their dress ensembles. We designed a set of mock-up samples in a local fashion style, as a first step in understanding possible applications of the emerging technology of organic interfaces.

The author was responsible for conducting the pre-design user study and initial user study of the mock-ups. The design idea of a shape-switching device was collectively done by the first, second and third authors. The mock-ups were hand made by the third author. The writing was shared by the first and second author, but with significant contribution from the fourth author.

## 8.5. Paper V: Fashion intelligent wearables: Apps and services for smart watches

Juhlin, O., Zhang, Y., Wang, J. and Andersson, A., Fashion intelligent wearables: Apps and services for smart watches, submitted to *Nordichi 2016*, in submission

This study explores how to apply fashion thinking in designing wearable devices, which are located on human bodies, similar to clothing items. The screen provides endless variations of visual expression, beyond traditional clothing. The topic motivates us to investigate the potential of assembling “fashion thinking” with services generation, to create new forms of use that wearers will adore, as they do with clothes. In an explorative design study we triangulate three methods i.e. a small study on the use of smart watches in dressing practices; an invention and design of a service called “Watch for Figuracy”, with a watch face contextually dependent on the wearer’s dressed ensemble, and finally an initial user feedback study. Altogether they indicate the potential of fashion wearable hybrids and shortcomings in utilizing color theory for matching the watch face to the outfit.

This author was responsible for conducting the pre-design user study and the initial user study of the application. The design of the prototype was collectively done by the four authors. The implementation of the design was done by the third and fourth authors. The writing of the paper was mainly conducted by the first and second author, and with significant contribution from the third author.

## 8.6 Related publications:

Zhang, Yanqing and Juhlin, Oskar (2011) Fashion as system or action net in “Fashion in All Things”: A case in color design of mobile phones, in Fashion: Exploring Critical Issues (E-book), Inter-disciplinary Press, ISBN: 978-1-84888-148-8

Zhang, Yanqing and Juhlin, Oskar (2012) A fashion phone for Swedish style- Exploring Outfit-centric design, in *Proceedings of Global Fashion Conference 2012*, Madrid, ISBN: 978-989-20-5336-3

Zhang, Yanqing, and Juhlin, Oskar (2015) Using crowd-sourcing to solve the fitting problems in online fashion sales, in *Proceedings of Global Fashion Management Conference 2015*, Florence, Italy

Zhang, Yanqing, Constructing Swedish fashion identity, Exhibition Review: Svenskt Mode (Swedish Fashion): 2000–2015, in *Journal of Fashion Theory*, August 2015

# 9. Bibliography

Addison, J. and Steele, R. (1879) The Spectator, A. Chalmers (ed.), New York: D. Appleton.

Adorno, T. W. (2002) *Aesthetic Theory*, trans and ed. Robert Hullot-Kentor, Continuum.

Alison, A. (1811) Essays on the Nature and Principles of Taste, Edinburgh: Bell and Bradfute.

Angeli, A., Sutcliffe, A. and Hartmann, J. (2006) Interaction, usability and aesthetics: What influences users’ preferences? in *Proceedings of Conference on Designing Interactive Systems (DIS '06)* New York: ACM press, 271–280.

Arnold, R. (1999) The Brutalized Body, *Fashion Theory*, Vol.3 (4): 487–502

Atkinson, P. (2009) The Social Organization of Aesthetics – A Note, MAiA, Vol. 2 (1): 69–72.

Baumgarten, A. G. (2007/1750/1973) Aesthetica/Ästhetik, Dagmar Mirbach ed. 2 Vols. Hamburg: Felix Meiner Verlag, 2007; partial translation in Alexander Gottlieb Baumgarten and Hans Rudolf Schweizer (1750/1973) Basel: Schwabe.

Bardzell, J., Pace, T. and Terrell, J. (2010) Virtual fashion and avatar design: a survey of consumers and designers. In Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries *(NordiCHI '10).* New York: ACM press, 599–602.

Bardzell, S. and Bardzell, J. (2007). Docile avatars: Aesthetics, experience, and sexual interaction in Second Life. In Proceedings of the 21st British HCI Group Annual Conference on People and Computers: HCI...but not as we know it *(BCS-HCI '07),* Vol. 1. British Computer Society, Swinton: UK, 3–12.

Bardzell, S. and Rosner, D. K. and Bardzell, J. (2012), Crafting quality in design: Integrity, creativity, and public sensibility, in *Proceedings of the Designing Interactive Systems Conference (DIS ’12)* New York: ACM press, 11–20.

Bardzell, J. (2009) Interaction criticism and aesthetics, In *Proceedings of Conference on Human Factors in Computing Systems (CHI ’09)* New York: ACM Press, 2357–2366.

Barthes, R. (1983) *The Fashion System*. Translated by Matthew Ward and Richard Howard, Berkeley: University of California Press.

Becker, H. (1982) *Art Worlds*, Berkeley: University of California Press.

Benjamin, W. (1968) *Illuminations: Essays and Reflections*, Hannah Arendt ed. New York: Schocken Books.

Berger, P. L. and Luckmann, T. (1991). *The Social Construction of Reality: A Treatise in the Sociology of Knowledge.* London: Penguin.

Biskjaer, M. M., Dalsgaard, P. and Halskov, K. (2014) A Constraint-based understanding of design spaces, in *Proceedings of Conference on Designing Interactive Systems (DIS ’14)* New York: ACM press, 453–462.

Blaszczyk, R. L. (2009) *Producing Fashion: Commerce, Culture, and Consumers,* Philadelphia: University of Pennsylvania Press.

Blaszczyk, R. L. (2012) *The Color Revolution,* Cambridge: MA: MIT Press.

Blumer, H. (1969) Fashion: From class differentiation to collective selection, *The Sociological Quarterly*, Vol.10 (3): 275–291.

Bonsiepe, G. (1962) Persuasive communication: Towards a visual rhetoric, in Theo Crosby, ed., *Uppercase 5*, London: Whitefriars Press, 19–34.

Bourdieu, P. (1984) Distinction: A Social Critique of the Judgment of Taste, [New ed.], London: Routledge.

Bourriaud, N. (2002) *Relational Aesthetics*. Dijon: Les presses du réel.

Breward, C. (1998) Cultures, identities, histories: Fashioning a cultural approach to dress, *Fashion Theory*, Vol. 2 (4): 301–314.

Breward, C. (2004) *Fashioning London: Clothing and the Modern Metropolis.* Oxford: Berg Publishing.

Brown, B. and Juhlin, O. (2015) *Enjoying Machines*, Cambridge, US: The MIT Press.

Carlyle, T. (1987) *Sartor Resartus*, Oxford: Oxford University Press.

Cixous, H. (1994) Sonia Rykiel in translation, in *On Fashion*, ed. Shari Benstock and Suzanne Ferris, New Brunswick, 95–99.

Collingwood, R. G. (1938) The Principles of Art, London: Oxford University Press.

Crane, D. (2000) *Fashion and Its Social Agendas: Class, Gender, and Identity in Clothing*, Chicago: University of Chicago Press.

Creswell, J. W. (2013) Qualitative Inquiry and Research Design: Choosing Among Five Approaches, 3., [updated] ed., Thousand Oaks: SAGE Publications,

Cushman, W. H. and Rosenberg*,* D. J., (1991) *Human Factors in Product Design,* Amsterdam: Elsevier Science.

Czarniawska, B. (2008) *A Theory of Organizing*, Cheltenham, UK: Edward Elgar Publishing.

Dewey, J. (2005) *Art as Experience*. New York: Perigee Trade.

Dickie, G. (1997) *Introduction to Aesthetics: An Analytic Approach*. New York: Oxford University Press.

Dickie, G. (1974) *Art and Aesthetics*, Ithaca, N.Y.: Cornell University Press.

Diefenbach, S., Kolb, N. and Hassenzahl, M. (2014) The “hedonic” in human-computer interaction: history, contributions, and future research directions. In Proceedings of the 2014 conference on Designing interactive systems *(DIS '14)*. New York: ACM press, 305–314.

Djelic, M.-L. and Ainamo, A. (2005), The telecom industry as cultural industry? The transposition of fashion logics into the field of mobile telephony, *Research in the Sociology of Organizations,* 23: 45–80.

Dowling, C. (2010) The aesthetics of daily life, *The British Journal of Aesthetics*, Vol. 50 (3): 225–242.

Duncum, P. (2002) Theorizing everyday aesthetic experience with contemporary visual culture, *Visual Arts Research*, Vol. 28 (2): 4–15

Dunne, L. (2011) Smart clothing in practice: key design barriers to commercialization, *Fashion Practice*, Vol. 2 (1): 41–66

English, B. (2013) *A Cultural History of Fashion in the 20th and 21st Centuries: From Catwalk to Sidewalk*, Bloomsbury Academic.

Eskilson, S. (2002), Color and consumption, *Design Issues,*18 (2): 17–29.

Entwistle, J. (2000) Fashion and the fleshy body: Dress as embodied practice, *Fashion Theory:* *The Journal of Dress, Body & Culture,* Vol. 4 (3): 323–347.

Entwistle, J. (2009) *Aesthetic Economy of Fashion: Markets and Value in Clothing and Model*. Oxford: Berg Publishers.

Esbjörnsson, M., Juhlin, O. and Östergren, M. (2004) Traffic encounters and Hocman: associating motorcycle ethnography with design. *Personal Ubiquitous Comput*. 8 (2): 92–99.

Falck, K. (2011) *Det Svenska Modeundret*, Stockholm: Norstedts.

Farren, A. and Hutchison, A. (2004) Cyborgs, new technology, and the body: The changing nature of garments, *Fashion Theory*, Vol. 8 (4) 461–476.

Fagerberg, P., Ståhl, A. and Höök, K. (2004) eMoto: Emotionally engaging interaction. *Personal and Ubiquitous Computing*, 8 (5): 377–381.

Faust, B. (1981), *Women, Sex and Pornography*, Harmondsworth: Penguin.

Featherstone, M. (1991) *Consumer Culture and Postmodern*, London: SAGE Publications Ltd.

Fernaeus, Y. and Jacobsson, M. (2009) Comics, robots, fashion and programming: outlining the concept of actDresses, in Proceedings of the 3rd International Conference on Tangible and Embedded Interaction (TEI '09). New York: ACM press, 3–8.

Fortunati, L. (2005) Mobile phones and fashion in post-modernity, *Telektronikk ¾*, 35–48.

Fiore, S., Wright, P. and Edwards, A. (2005) A pragmatist aesthetics approach to the design of a technological artifact, in *Proceedings of the 4th Decennial Conference on Critical Computing: Between Sense and Sensibility*, Aarhus, Denmark, 129–132.

Flick, U. (2009) *An introduction to qualitative research*, 4th ed., SAGE Publications

Flügel, J. C. (1930) *The Psychology of Clothes*, London: Hogarth.

Frayling, C. (1993) *Research in Art and Design*. Royal College of Art London.

Gane, M. (1991) *Baudrillard’s Bestiary: Baudrillard and Culture*. London: Routledge.

Gaver, W. (2012) What should we expect from research through design? In *Proceedings of* ***Conference on Human Factors in Computing Systems*** *(CHI '12)* New York: ACM press. 937–946.

Goffman, Erving (1990[1959]). *The Presentation of Self in Everyday Life*. London: Penguin.

Gray, P. S., Williamson, J. B., and Karp, D. A. (2007) *The Research Imagination: An Introduction to Qualitative and Quantitative Methods*, Cambridge: University Press.

Hayashi, Y. and Masuko, S. (2013) AteGau: Projector-based online fashion coordination system, in *CHI '13 Extended Abstracts on Human Factors in Computing Systems (CHI EA '13)*, New York: ACM press, 973–978.

Hallnäs, L. and Redström, J. (2002) From use to presence: on the expressions and aesthetics of everyday computational things, *ACM Trans. on HCI*, 9 (2): 106,124.

Hassenzahl, M. (2004) The interplay of beauty, goodness and usability in interactive products. *Human Computer Interaction* 19: 319–349.

Hassenzahl, M. (2003) The thing and I: understanding the relationship between user and product. In M. Blythe, C. Overbeeke, A. F. Monk, & P. C. Wright (eds.), *Funology: From Usability to Enjoyment*. Dordrecht: Kluwer Academic Publishers.31–42.

Hidayati, S. C. and Hua, K.-L. and Cheng, W.-H. and Sun, S.-W. (2014) What are the fashion trends in New York?, in *Proceedings of the 22nd ACM International Conference on Multimedia (MM '14)* New York: ACM press, 197–200.

Heskett, J. (2005) *Design: A Very Short Introduction*. Oxford: University Press.

Hoenig, F. (2005) Defining Computational Aesthetics, in L. Neumann, M. Sbert, B. Gooch and W. Purgathofer (eds.) *Computational Aesthetics in Graphics, Visualization and Imaging*, The Eurographics Association, 13–18.

Hollander, S. C., Rassuli, K. M., Jones, D. G. B. and Dix, L. F. (2005) Periodization in marketing history, *Journal of Macro-marketing,* Vol. 25: 32–41.

Hughes, L. and Atkinson, D. and Berthouze, N. and Baurley, S. (2012) Crowdsourcing an emotional wardrobe, in *CHI '12 Extended Abstracts on Human Factors in Computing Systems (CHI EA '12)*, New York: ACM press, 231–240.

Hutcheson, F. (1726/2004) An Inquiry into the Original of Our Ideas of Beauty and Virtue, W. Leidhold (ed.), Indianapolis: Liberty Fund.

Iwata, T., Watanabe, S. and Sawada, H. (2011) Fashion coordinates recommender system using photographs from fashion magazines. In *Proceedings of the Twenty-Second International Joint Conference on Artificial Intelligence*, Toby Walsh (ed.), AAAI Press, Vol. 3: 2262–2267.

Isenberg, A. (1987, orig. 1950) Analytical philosophy and the study of art, The Journal of Aesthetics and Art Criticism, 46 Special Issue: Analytic Aesthetics: 125–136.

Juhlin, O. (2010) *Social Media on the Road The Future of Car Based Computing*, London: Springer.

Kant, I. (1988) *Critique of Judgment*. Trans. J. C. Meredith. Oxford: Clarendon.

Karjalainen T.-M. and Snelders, D. (2010) Designing visual recognition for the brand, *Journal of Product Innovation Management*, Vol. 27 (1): 6–22.

Kasesniemi, E.-L. and Rautiainen, P. (2002) Mobile culture of children and teenagers in Finland”. In *Perpetual Contact*, J. E. Katz and M. A. Aakhus (eds.). New York: Cambridge University Press, 170–192.

Katz, J. E. and Sugiyama, S. (2006) Mobile phones as fashion statements: Evidence from student surveys in the US and Japan, *New Media & Society* 8 (2): 321–337.

Kelle, U. and Erzberger, C. (2004) Qualitative and quantitative methods: Not in opposition, *A Companion to Qualitative Research*, U. Flick, E. von Kardorff and I. Steinke (eds.) Translated by Bryan Jenner, London: SAGE Publications, 172–178.

Krippendorff, K. (2004). Content Analysis: an Introduction to Its Methodology. 2nd ed. Thousand Oaks, Calif.: SAGE Publications.

Kurutz, S. (2011) Fashion bloggers, posted and represented, *The New York Times*, Sep. 26, nytimes.com/2011/09/29/fashion/fashion-bloggers-get-agents.html?\_r=0, accessed Nov.10, 2015.

Lavie, T. and Tractinsky, N. (2004). Assessing dimensions of perceived visual aesthetics of Web sites. *International Journal of Human–Computer Studies*, 60: 269–298.

Latour, B. (1986) The powers of associations. In J. Law (ed.) *Power, Action and Belief, a New Sociology of Knowledge*. London: Routledge and Kegan Paul.

Latour, B. and Lepinay, V. A. (2010) *The Science of Passionate Interests: An Introduction to Gabriel Tarde’s Economic Anthropology*, Chicago, U.S.: Prickly Paradigm Press.

Lim, Y-K., Stolterman, E., Jung, H, and Donaldson, J. (2007) Interaction gestalt and the design of aesthetic interactions, in *Proceedings of the 3rd Conference on Designing Pleasurable Products and Interfaces*, New York: ACM press, 239–254.

Ling, R. (2003) Fashion and vulgarity in the adoption of the mobile telephone among teens in Norway. In L. Fortunati, J. Katz and R. Riccini (eds.), *Mediating the Human Body: Technology, Communication, and Fashion*. Mahwah, NJ: Lawrence Erlbaum. 93–102.

Liu, C. M. and Donath, J. S. (2006) Urbanhermes: social signaling with electronic fashion. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems *(CHI '06)*, New York: ACM press, 885–888.

Loschek, I. (2009) *When Clothes Become Fashion: Design and Innovation Systems*, London: Bloomsbury Academic

Löwgren, J. and Stolterman, E. (2004). Thoughtful Interaction Design: a Design Perspective on Information Technology. Cambridge, U.S.: MIT Press.

Löwgren, J. (2009) Toward an articulation of interaction aesthetics. *New Review of Hypermedia and Multimedia*, 15 (2):129–146.

MacLean, A., Young, R.M., Belotti, V.M.E., and Moran, T.P. (1991) Questions, options, and criteria: Elements of design space analysis. Hum.-Comput. Interact. 6 (3): 201–250.

Marx, K. (1978) Economic and philosophic manuscripts of 1844, in Robert C. Tucker, ed. *The Marx-Engels Reader*, 2nd ed. New York: W.W. Norton Company.

Marathe, S. and Sundar, S. S. (2011) What drives customization?: control or identity? In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI ’11)*, New York: ACM press, 781–790.

Martin, R. (2009) *The Design of Business: Why Design Thinking Is the Next Competitive Advantage*. Boston, MA: Harvard University Press.

Mazza, C., and Alvarez, J. L., (2000) Haute couture and Prét-a-Porter: The popular press and the diffusion of management practices. *Organization Studies* 21 (3): 567–588.

McCarthy, J. and Wright, P. (2007) *Technology as Experience*, Cambridge, U.S.: MIT Press.

McKelvey, K. and Munslow, J. (2011) *Fashion Design: Process, Innovation and Practice*, 2nd Ed., Hoboken, U.S.: John Wiley & Sons.

McCurdy, M., Connors, C., Pyrzak, G., Kanefsky, B. and Vera, A. (2006) Breaking the fidelity barrier: an examination of our current characterization of prototypes and an example of a mixed-fidelity success. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems *(CHI '06)*, New York: ACM press, 1233–1242.

Mårtenson, I. G. (2012) H&M: Documenting the story of one of the world’s largest fashion retailers. *Business History*, Vol. 54 (1): 108–115.

Nam, J., Hamlin, R., Gam, H. J., Kang, J. H., Kim, J., Kumphai, P., Starr C. and Richards, L. (2007) The fashion-conscious behaviors of mature female consumers, *International Journal of Consumer Studies*, Vol. 31 (1): 102–108.

Nicklas, C. (2014) One essential thing to learn is color: harmony, science and color theory in mid-nineteenth-century fashion advice, *Journal of Design History* 27 (3): 218–236.

Ngo, D. C. L. and Byrne, J. G. (2001) Application of an aesthetic evaluation model to data entry screens. *Computers in Human Behavior*, Vol.17: 149–185.

Nixon, N. W. and Blakley, J. (2012) Fashion thinking: Towards an actionable methodology, *Fashion Practice* 4 (2): 153–176.

Noble, C. H. and Kumar, M. (2010) Exploring the appeal of product design: A grounded, value-based model of key design elements and relationships. *Journal Of Product Innovation Management* 27 (5): 640–657.

Norman, D. A. (2004). *Emotional Design: Why We Love (or Hate) Everyday Things*. New York: Basic Books.

Pacione, C. (2010) Evolution of the mind: The case for design literacy. *Interactions* 17 (2): 6–11.

Pan, Y. and Stolterman, E. (2015) What if HCI becomes a fashion driven discipline? In Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems *(CHI '15)*. New York: ACM press, 2565–2568.

Pan, Y. and Blevis, E. (2014) Fashion thinking: Lessons from fashion, sustainable interaction design, concepts and issues. In *Proceedings of DIS Conference on Designing Interactive Systems* *(DIS '14)*. New York: ACM press, 1005–1014.

Patton, M. Q. (2002) *Qualitative Research & Evaluation Methods*, London: SAGE Publications.

Perovich, L., Mothersill, P. and Farah, J. B. (2014) Awakened apparel: Embedded soft actuators for expressive fashion and functional garments, in Proceedings of the 8th International Conference on Tangible, Embedded and Embodied Interaction *(TEI '14)*. New York: ACM press, 77–80.

Petersen, M. G., Iversen, O. S., Krogh, P. G. and Ludvigsen, M. (2004) Aesthetic interaction: A pragmatist aesthetics of interactive systems, in *Proceedings of the 5th Conference on Designing Interactive Systems (DIS ’04)*. New York: ACM. 269–276.

Pierce, J. (2014) On the presentation and production of design research artifacts in HCI. In Proceedings of the 2014 conference on Designing interactive systems *(DIS '14)*. New York: ACM press, 735–744.

Postrel, V. (2004) *The Substance of Style: How the Rise of Aesthetic Value Is Remaking Commerce, Culture, and Consciousness*, New York: Harper Perennial

Pycock, J. and Bowers, J. (1996) Getting others to get it right: an ethnography of design work in the fashion industry. In Proceedings of the 1996 ACM conference on Computer supported cooperative work *(CSCW '96)*, Mark S. Ackerman (ed.). New York: ACM press, 219–228.

Quinn, J. M. and Tran, T. Q. (2010) Attractive phones don’t have to work better: independent effects of attractiveness, effectiveness, and efficiency on perceived usability. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems *(CHI '10)*. New York: ACM press, 353–362.

Reynolds, W. H. (1968) Cars and clothing: Understanding fashion trends, *Journal of Marketing*, *28*, American Marketing Association, 44–49.

Roberts, L., Rankin, L., Moore, D., Plunkett, S., Washburn, D., and Wilch-Ringen, B. (2003). Looks good to me. In CHI '03 Extended Abstracts on Human Factors in Computing Systems *(CHI EA '03)*. New York: ACM press. 818–819.

Robichaud, D., Cooren, F. (2013) *Organization and Organizing: Materiality, Agency, and Discourse,* London: Routledge.

Rose, C. (2010) *Making, Selling and Wearing Boys’ Clothes in Late-Victorian England*, Farnham, U.K.: Ashgate Publishing Company.

Santayana, G. (2002) *The Sense of Beauty: Being the Outline of Aesthetic Theory*, New Jersey, U.S.: Transaction Publishers.

Scott, W. R. (2004) Institutional theory, in G. Ritzer, ed. *Encyclopaedia of Social Theory*, CA: Sage. 408–414.

Schiphorst, T. (2009) Soft(n): Toward a somaesthetics of touch. In CHI '09 Extended Abstracts on Human Factors in Computing Systems *(CHI EA '09)*. New York: ACM press, 2427–2438.

Sefelin, R., Tscheligi, M. and Giller, V. (2003) Paper prototyping, what is it good for?: A comparison of paper, and computer-based low-fidelity prototyping. In CHI '03 Extended Abstracts on Human Factors in Computing Systems *(CHI EA '03)*. New York: ACM press, 778–779.

Seymour, S. (2008) *Fashionable Technology: The Intersection of Design, Fashion, Science, and Technology*, Vienna, Austria: Springer.

Shusterman, R., (2000) *Pragmatist Aesthetics: Living beauty, Rethinking Art*, 2nd ed., Lanham, U.S.: Rowman & Littlefield.

Shusterman, R. (2004), Pragmatism and East-Asian thought, *Metaphilosophy*,  Vol. 35 (1/2): 13–43.

Shade, L. R. (2007) Feminizing the mobile: Gender scripting of mobiles in North America, *Continuum*, 21 (2): 179–189.

Simmel, G. (1997) Simmel on Culture: Selected Writings, London: Sage.

Skog, B. (2002). Mobiles and the Norwegian teen: Identity, gender and class. In J. E. Katz and M. Aakhus (Eds.), *Perpetual Contact: Mobile Communication, Private Talk, Public Performance*, Cambridge University Press, 255–273.

Skov, L. (1996) Fashion trends, Japonisme and Postmodernism: Or “what is so Japanese about Comme des Garçons?”, in *T*heory, Culture & Society 13 (3): 129–151.

Sonderegger, A., Uebelbacher, A., Pugliese, M. and Sauer, J. (2014) The influence of aesthetics in usability testing: The case of dual-domain products, in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '14),* New York: ACM press. 21–30.

Steele V. (2000) Fashion: Yesterday, Today & Tomorrow, in N. White and I. Griffiths (eds.) *The Fashion Business: Theory, Practice and Image,* Oxford: Berg.

Svendsen, L. (2006) *Fashion: A philosophy*, translated by John Irons, London: Reaktion Books.

Sztompka, P. (2012) Visible meanings, in J. C. Alexander, D. Bartmański, and B. Giesen (eds.) *Iconic Power: Materiality and Meaning in Social Life*, New York: Palgrave Macmillan, 233–247.

Tractinsky, N., Katz A.S., and Ikar, D. (2000) What is beautiful is usable. *Interacting with Computers*, 13 (2): 127,145.

Tractinsky, N. (1997) Aesthetics and apparent usability: Empirically assessing cultural and methodological issues. In Proceedings of the ACM SIGCHI Conference on Human factors in computing systems *(CHI '97)*. New York: ACM press, 115–122.

Tseëlon, E. (2001) Fashion research and its discontents, in *Fashion Theory: The Journal of Dress, Body and Culture*, 5/4: 435–452.

Urry, J. (2000) *Sociology Beyond Societies: Mobilities for the Twenty,First Century*. London: Routledge.

Veblen, T. (2007/1899) The Theory of the Leisure Class, New York: Oxford University Press.

Virzi, R.A., Sokolov, J.L., Karis, D. (1996) Usability problem identification using both low, and high-fidelity prototypes, in *Proceedings of the SIGCHI conference on Human factors in computing systems: common ground (CHI '96)*, New York: ACM press, 236–243.

Volonté, P. (2012) Social and cultural features of fashion design in Milan. *Fashion Theory: The Journal of Dress, Body & Culture*, 16 (4): 399–432.

Wan, F., Young, S. and Fang, T. (2001) Passionate surfers in image-driven consumer culture: Fashion-conscious, appearance, savvy people and their way of life. *Advances in Consumer Research* 28: 266–275.

Wilson, E. (2003) *Adorned in Dreams: Fashion and Modernity*. New Jersey: Rutgers University Press.

Wright, P., Wallace, J. and McCarthy, J. (2008) Aesthetics and experience-centered design. ACM Trans. *Comput-Hum Interact*. 15 (4) Article 18.

Wright, P. and McCarthy J. (2008) Empathy and experience in HCI, in Proceedings of the SIGCHI Conference on Human Factors in Computing Systems *(CHI '08)*. ACM, New York: ACM Press, 637–646.

Yamaguchi, K., Berg, T. L. and Ortiz, L. E. (2014) Chic or social: Visual popularity analysis in online fashion networks, in Proceedings of the ACM International Conference on Multimedia *(MM '14).* New York: ACM press, 773–776.

Zimmerman, J., Forlizzi, J., and Evenson, S. (2007) Research through design as a method for interaction design research in HCI, in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '07),* New York: ACM press, 493–502.

## Appendix 1

## Appendix 2

