Understanding and designing pleasant experiences with products

Ortíz Nicolás Juan Carlos

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Imperial College London
Mechanical Engineering Department

A thesis submitted for the degree of Doctor of Philosophy

Imperial College London

Declaration of Originality

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Except where otherwise stated, this thesis is the result of my own research. This research was conducted in the Design Engineering Group at Imperial College between May 2010 and November 2013. I certify that this thesis has not been submitted in whole or in parts as consideration for any other degree or qualification at this or any other institute of learning.

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May, 2014

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Abstract

* * *

This thesis reports an investigation to develop new understanding of pleasant experiences resulting from human-product interaction, which is then used to inform the development of a process and tools to support designers. The key argument of this research is that pleasant experiences can be designed. The thesis starts by providing a foundation of user experience. A new framework of user experience is proposed based on the analysis and synthesis of previous literature *(Chapter 1)*.

The interest then shifts from user experience to characterising pleasant experiences. Four empirical studies are presented focusing on aspects such as experiences with great products and the role of positive emotions in those experiences. The first study, investigating how users experience great products, identifies and characterises pragmatic and significant experiences *(Chapter 2)*. Great products were studied as people understood and experienced them. In the second study, a set of twenty-five positive emotions are ranked by users and designers to understand what emotions they prefer to experience and elicit through their designs *(Chapter 3)*. Highly-preferred emotions by users were: satisfaction, inspiration, confidence, joy, amusement and relaxed. Highly-preferred emotions by designers were: curiosity, joy, surprise, confidence, inspiration, fascination, satisfaction, and pride. In the third study, the twenty-five positive emotions are researched to understand their differences in pleasantness and arousal *(Chapter 4)*. Three levels of arousal and pleasantness of emotions were identified and these are: exciting, neutral and calm emotions, and pleasant, quite pleasant, and very pleasant emotions. In the fourth study, anticipation, confidence, inspiration, and sympathy are investigated in depth to create rich profiles of the emotions *(Chapter 5)*. The profiles focus on the triggers, appraisal structures, thought-action tendencies, and thematic appraisals of the emotions.

Building on the understanding of pleasant experiences emerged from the research above, the thesis then presents evaluative research. In the fifth study, a design process and tools to support designers in the elicitation of pleasant experiences are proposed and tested. The process shows how emotional profiles can be used by designers as a means to create pleasant experiences through emotions *(Chapter 6)*.

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* * *

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Pleasant Experiences and Product Design

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Industry is interested in creating products that are successful in the market, i.e. products that 'connect' with consumers (Law et al, 2009). The connection can be instrumental (what the product does), aesthetic (how the product pleases consumer's senses), and symbolic (how the product stimulates meaning in the consumer). All these types of connections influence product consumption. For example, before buying a camera consumers may search for its technical details, such as the lens type, camera resolution, weight, and battery duration. These attributes are objective and measurable. Consumers, however, are also influenced by the appearance of a camera, from which they can 'assess' its aesthetic pleasure and symbolic meaning. For example, they may like the overall look of a camera based on its colour, textures, and finish. More so, they may think that a camera looks professional due to their personal aspirations, e.g. becoming a better photographer. These attributes, compared to the previous set, are subjective and difficult to measure. In the design community instrumental, aesthetic, and symbolic attributes have been referred to as the functions of products (Crilly, 2010; Aurisicchio, et al, 2011). These functions play a major role in the design of artefacts.

A typical way to start the design process consists of writing a brief that states the functions that the product has to perform, e.g. instrumental and aesthetic (see Crilly et al, 2008). A limitation of this approach is that 'thinking of' different functions and designing them as separate elements neglects an important aspect such as the experience delivered by the product. It has been suggested that consumers are more interested in the overall experience provided by an artefact than in the specific functions that it performs (Chapman, 2005 p.19). Thus, an approach that considers the experience of users is needed in design. In recent years scholars have started to investigate user experience to understand the mechanisms that create a

pleasant experience as a result of human-product interactions (Jordan, 2000; Porter et al, 2008; Hassenzahl, 2010). The intention of these scholars is to develop new knowledge of user experience and use it to define strategies that designers could rely upon for designing pleasant experiences. This doctoral project fits in this line of research and aims to investigate the important problem of how pleasant experiences unfold including the role of human needs, positive emotions, thoughts and actions. This problem has been only partially investigated. In particular, existing research still holds on a general concept of pleasure in human-product interactions, which needs to be deconstructed to better understand it. In addition, current research on pleasure is fragmented with studies focusing on either physical, cognitive, social, or psychological aspects. Instead, given that these aspects operate simultaneously there is a need to study pleasant experiences holistically. In the following sections we will discuss in more detail the relevance and potential benefits of investigating pleasant experiences.

▪ CONSUMER NEEDS

Jordan (2000) in his seminal book 'Designing Pleasurable Products' argues that there are at least three needs that are fulfilled by products, namely functionality, usability and pleasure. Functionality is related to effectively performing a task with a product. Usability is related to the ease with which a task is performed. Pleasure is related to the experience and the emotions involved. Jordan (2000) also suggests the existence of a hierarchical relationship between these three needs, in which functionality is at the bottom, usability in the middle and pleasure at the top, as shown in *Figure 1*. The idea of the hierarchy of needs, originally developed by Maslow (1970), has been borrowed by Jordan to explain differences in the needs fulfilled by products, the importance of pleasure and the little understanding of these issues in product design. In order to find a way into the issue of people-product relationships, it is necessary not only to have an understanding of how people use products, but also of the role that products play in people's lives (Jordan, 2000). The work of Jordan has had significant impact in user experience research because he has been one of the first scholars to acknowledge the role of pleasure in human-product interactions and to suggest how pleasure can be considered in design practice. One of the limitations of his work, however, is that it maintains a general concept of pleasure (Desmet, 2012).

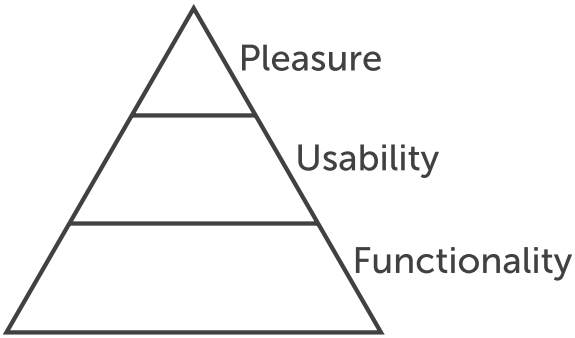


Figure 1. *Hierarchy of needs (Adapted from Jordan, 2000)*

Studying pleasurable or pleasant experiences is expected to deliver a better understanding of the critical aspects of those experiences and to identify which ones can be actually designed. This knowledge is fundamental to design for experiences.

▪ A SHIFT FROM TECHNICAL ATTRIBUTES TO ENJOYMENT AND PLEASURE

It has been argued that over the years a tool-oriented approach has dominated the development of products (Jordan, 2003 p. xii). This approach, focusing on human physical and cognitive capabilities, has delivered artefacts that have helped users perform tasks with an emphasis on the instrumental function. This emphasis indicates the importance given so far to the usability and usefulness of the product (Tractinsky, et al, 2000). Rafaeli and Vilnai-Yavetz (2003) have noted that if not satisfied the instrumental functions of an artefact tend to elicit negative emotions, e.g. frustration. However, if adequately implemented they do not promote positive emotions, e.g. fun. A similar argument has been made by Hassenzahl (2010 p. 28), who has mentioned that the best usability may never be able to 'put a smile on users' faces' because it only makes the difference between bad and acceptable. The tool-oriented approach, therefore, has been questioned because it does not take into consideration human hopes, fears, dreams, feelings, and self-image (Jordan, 2003). These are associated with the affective and aspirational levels of a person. User experience aims to consider affective needs, without neglecting physical and cognitive ones. As argued by Hassenzahl (2010 p.55), functionality, usability, and

pleasure are different attributes of a product, but they have to be aligned to create a pleasant experience. User experience should focus on understanding what is relevant for users, not the efficacy and functionality of the product.

Studying user experience allows a better understanding of how the affective needs of users are fulfilled through products. This knowledge is an alternative to the tool-oriented approach and can complement it.

▪ USER EXPERIENCE AND POSITIVE PSYCHOLOGY

In January 2000 Seligman and Csikszentmihalyi edited a special issue of American Psychologist devoted to positive psychology. They have argued that psychology now understands a range of negative human characteristics, e.g. depression. Nevertheless, little is known about the aspects that make life worth living, e.g. happiness. Seligman and Csikszentmihalyi's proposal has resonated in the field of new product development (NPD), and particularly in user experience (see Hassenzahl, 2010). It has been suggested that one of the aims of user experience is to create products that provide pleasant experiences (Hassenzahl, 2010; Ortiz Nicolas and Aurisicchio, 2011; Desmet, 2012). This endeavour is surely less complex than understanding human happiness but it may offer useful information towards this objective. Artefacts, in fact, are companions of users and play an essential part in human activities and many of these rely upon them (Susi and Ziemke, 2001). For instance, there are some artefacts that are used as means to enjoy life such as toys or musical instruments. The experience-oriented approach to design with its emphasis on understanding what makes an experience pleasurable and 'good' is supported by the findings of Hektnert and colleagues (2007 p.26). These authors explain that the various theories that have flourished throughout the history of psychology indicate that individuals look for pleasure and avoid pain, regardless of their interpretative framework.

In times in which product development and innovation have predominantly focused on technology and away from users is important to understand how to provide experiences that impact on users' lives (Chapman, 2005: p.10).

▪ CONSUMER DISSATISFACTION AND PRODUCT RETURNS

A recent study of consumers' complains by Den Ouden, Yuan, and Sonnemans (2006) revealed that business deals with complaints based on an instrumental

approach, i.e. ensuring that products meet the technical specifications. More so, it has identified a rise in non-technical complaints, e.g. expectations, and desires. Several of these resulted in goods being returned within a few days of purchase. The authors conclude that the traditional way of looking at product quality and reliability, earlier referred to as the tool-oriented approach, is not suitable for handling those complaints. A way to handle them is to better understand consumers' experiences in all the phases of their interaction with the artefact as it will help capture the reasons for dissatisfaction.

By carrying out research on pleasant experiences, knowledge can be gained to understand how they influence the success or failure of products in the market. At the moment we know that a product that performs well in its instrumental function does not guarantee its success in the market.

▪ PLEASANT EXPERIENCES AND BRAND IMPRESSION

Industry is typically interested in establishing long-term relationships with consumers (Law, et al, 2009). It has been suggested that user experience is an approach that industry could use to establish a long-lasting relationship with users (Kujala and colleagues, 2011). A pleasant experience provided by a product can be seen as a strategy to develop favourable attitudes towards the brand. Although there are important differences between brands and products, they influence each other (Govers and Schoormans, 2005). For example, based on previous experiences with the products of a brand, users may assume that new artefacts are easy to operate without need of evaluation (Creusen, and Schoormans, 2005). Hekkert and Schifferstein (2008) suggest that in a store, characteristics of the atmosphere such as modern, fresh, and impressive may become associated with the brand. Similarly, the characteristics of products will influence the overall impression of its brand. This influence has been explained through the halo effect, which in product design can be considered as the overall positive impression of the product that leads to a positive impression of the brand and vice versa. The important aspect to consider for designers is that the experience that users will have with a product is likely to impact on the adoption or rejection of other artefacts from the same brand.

Research aim and objectives

The aim of this research is to develop new knowledge of pleasant experiences with durable products and use it to inform the development of methods and tools to support designers interested in designing for pleasant experiences. To guide the research, the following objectives have been established.

Objective A: To undertake a critical review of the state of the art in user experience and to analyse, compare and synthesises existing knowledge.
Qa1: What models have been proposed to characterise user experience?
Qa2: What are the properties and constituent elements of user experience?

Objective B: To investigate the experience of 'great' products by users in daily life.
Qb1: How do users experience 'great' products in daily life?
Qb2: What needs and emotions do 'great' products fulfil and elicit?

Objective C: To investigate a set of twenty-five positive emotions in relation to frequency of experience (users), preference for experience (users), preference for elicitation (designers), difficulty of elicitation (designers), pleasantness (users) and arousal (users). The set of twenty-five emotions was defined based on its relevance to product design.
Qc1: Which positive emotions are more or less frequently experienced by users in relation to products? (frequency of experience)
Qc2: Which positive emotions do users prefer to experience in relation to products? (preference for experience)
Qc3: Which positive emotions do designers prefer to elicit through product design? (preference for elicitation)
Qc4: Which positive emotions are more or less difficult to elicit by designers through product design? (difficulty of elicitation)
Qc5: How do users assess positive emotions based on pleasantness and arousal? (pleasantness and arousal)

Objective D: To understand in depth anticipation, confidence, inspiration and sympathy, and form rich descriptions of these emotions.
Qd1: How do users experience anticipation, confidence, inspiration, and sympathy with products?
Qd2: What are the triggers, appraisal structures, and thought-action tendencies involved in experiencing the four emotions?

Objective E: To develop tools to elicit positive emotions and test their usefulness as part of a design process.
Qe1: How to develop tools to guide designers in the elicitation of positive emotions based on the results from Objective D?
Qe2: How useful are the tools and why?

Figure 2 shows the research questions grouped under the three principal phases of the project. The first phase of the project is the exploration and knowledge foundation. The second phase is the design knowledge development. Finally, the third phase is the design support development.

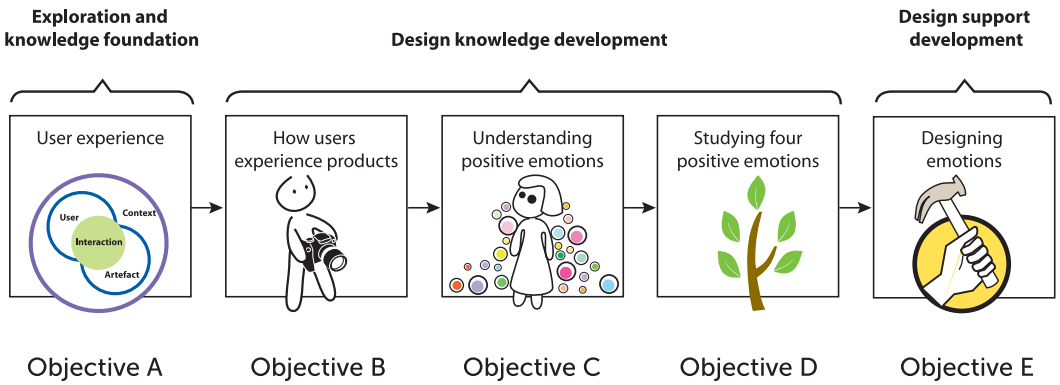


Figure 2. *Phases and objectives of the research*

||

Methodology

This section presents the philosophical stand and the overall research approach. It also provides an overview of the research methods used in the studies undertaken in this project.

▪ PHILOSOPHICAL STAND

Alternative philosophical stands considered as part of this project to frame the research are now presented and one of these is selected and justified. Four commonly adopted philosophical stands in design research are: advocacy/participatory, pragmatism, constructivism and positivism (Creswell, 2007). The advocacy/participatory and the pragmatism philosophical stands were judged not fit for this research. The first because this work does not seek to create an agenda of action to change the lives of participants, e.g. empowering women. The second because this research does not only focus on applications, i.e. 'what works' and solutions to problems (Patton, 1990 in Creswell, 2007). It rather aims to understand a specific phenomenon, pleasant experiences with products. The two remaining stands are now compared in *Table 1* as provided by Easterby-Smith and colleagues (1991).

Social constructivism is a philosophical stand which relies on the subjective interpretation of the world by a person, and the way in which that person makes meaning of it, for example meanings directed toward certain objects or things (Creswell, 2007: p 21). In contrast, positivism maintains that the world is external and objective. Social constructivism was judged fit to support this project because we want to understand the subjective interpretations of pleasant experiences from the perspective of users, including their perceptions, thoughts, feelings, and emotions.

▪ RESEARCH APPROACH

To address the main research aim the project was broken down into three phases each with its own objectives, see *Figure 1*. The objectives were answered through a literature review and five empirical studies. The mapping between the research phases, the objectives, and the studies undertaken to answer them is shown in *Table 2*. For each study *Table 2* shows also the data collection method employed, the main outcome, and the chapter where the study is reported.

	Positivism	Social Constructivism
The observer	must be independent	is part of what is being observed
Human interests	should be irrelevant	are the main drivers of science
Explanations	must demonstrate causality	aim to increase general understanding of the situation
Research progresses through	hypotheses and deductions	gathering rich data from which ideas are induced
Concepts	need to be operationalized so that they can be measured	should incorporate stakeholder perspectives
Units of analysis	should be reduced to simplest terms	may include the complexity of whole situations
Generalization through	statistical probability	theoretical abstraction
Sampling requires	large numbers selected randomly	small numbers of cases chosen for specific reasons

Table 1. *Contrasting implications of positivism and social constructionism*

Research phase	Objective	Study	Data collection method	Outcome	Chapter
Exploration and knowledge foundation	A	Literature review	Publication review	The state of the art was connected and synthesised in a general framework of user experience.	One
Design knowledge development	B	Study 1	Interviews	Two experiences were identified as a results of users interacting with 'great' products.	Two
	C	Study 2	Interviews	The preferences of users and designers for experiencing or eliciting positive emotions with products were identified.	Three
	C	Study 3	Questionnaire	The pleasantness and arousal of positive emotions were characterised.	Four
	D	Study 4	Interviews	Four profiles of positive emotions were created that describe how they are elicited by human-product interactions.	Five
Design support development and implementation	E	Study 5	Mixed method	A design process and two tools were tested with a group of designers to elicit positive emotions through their designs.	Six

Table 2. *Studies carried out in this research project*

The three main phases of the research are: 1) exploration and knowledge foundation; 2) design knowledge development; and 3) design support development and implementation. The phases are now introduced showing the research undertaken in each of them.

Phase 1) Exploration and knowledge foundation

In this phase the attention was directed towards understanding the key elements of user experience as identified by other scholars. The literature review focused on work published on user experience in the last ten years. Based on this review a more comprehensive understanding of user experience was gained and a general framework was developed.

Phase 2) Design knowledge development

In this phase the interest moved from general to specific aspects of user experience. The first study had the objective of understanding how users experience 'great' products. The needs and emotions that 'great' product respectively fulfil and trigger were also investigated. To accomplish this objective semi-structured interviews were conducted and cards were employed to study the needs and emotions of users. Two types of experiences were identified and named pragmatic and significant. It was also identified that great products enhance pleasant experiences.

With the knowledge developed through the literature review and the first study the focus moved towards understanding the role of positive emotions in user experience. In particular at this stage it was judged important to understand positive emotions as a means to characterise pleasant experiences. Most of the researchers in the field of user experience agree on the key role that emotions have in experience and their impact on the evaluation of a product. The second study had the objective of investigating a set of twenty-five positive emotions in relation to frequency of experience and preference for experience by users, and preference for elicitation and difficulty of elicitation by designers. Semi-structured interviews were used to work with users and designers. Participants were asked to rank emotions printed on cards against the qualities listed earlier. Participants were subsequently interviewed to reconstruct the rationale for their ranking. It was identified that the most preferred emotions were similar between the two groups. It was also identified that when aiming to design for positive emotions designers rely on self-referential strategies.

The third study had the objective of investigating the same set of twenty-five positive emotions in relation to pleasantness and arousal. In this case, questionnaires were employed because previous literature on design and emotions had successfully used them. Inspired by previous work we employed collages to stimulate participants' memories of the emotions that they had experienced in the past with artefacts. This research enabled to identify the most pleasant emotions elicited through human-product interactions, as well as, those that are exciting, median arousal, or calm.

At this stage the research focused on developing rich knowledge about selected positive emotions. The fourth study had the objective of understanding in depth four positive emotions resulting from human-product interactions and form rich

descriptions of the emotions. The emotions selected were anticipation, confidence, inspiration, and sympathy. Semi-structured interviews were used to develop new knowledge about these emotions. Users were asked to bring along two products that triggered one of the four emotions. This enabled to gather information that is part of their daily life. Users also ranked a set of eight pre-selected products based on a second emotion. This enabled the researcher to gather immediate emotional reactions. With the understanding generated detailed profiles were formed for anticipation, confidence, inspiration, and sympathy.

Phase 3) Design support development and implementation

In this phase the interest turned on implementing the knowledge developed during this project in the practice of product design. The fifth study had the objective of developing design support to elicit anticipation, confidence and inspiration, and testing its usefulness. A workshop was organised in which a group of designers followed a pre-defined process to design for emotions. The decision to employ a workshop as research method was made on the basis that workshops are a common format through which designers are trained and undertake collaborative work. During the workshop two tools were provided to designers that describe the experiences of the three emotions through artefacts. After completing the design task the designers filled in a questionnaire to capture the perceived usefulness of the design process and tools to design for emotions. Designers also participated in a group discussion in which they expressed their views on the potential benefits, limitations, and challenges of the used process and tools. The research identified that the process and tools were useful. In particular, participants to this study reported that the process and tools employed influenced their personal understanding of the assigned emotion, and their way of seeing users, generating ideas, and making design decisions.

III

Contributions

The main contributions of this thesis are reported next:

A general framework of user experience was developed based on an extensive review of the literature. The development of the framework has strengthened existing knowledge in the field of user experience by connecting sparse concepts. The framework identifies six aggregates of user experience, namely *subjective*, *conscious*, *intentional*, *emotional*, *interconnected* and *dynamic*, and presents four constituent elements of user experience, namely the *user*, the *interaction*, the *artefact*, and the *context*. The framework can be used as a platform of discussion by scholars investigating user experience. Designers can also benefit from it as they can use it to guide decision making in the design process.

Two types of pleasant experiences were identified as a result of user interaction with great products, namely *pragmatic* and *significant*. This typology adds to previous work by taking a broad view on experience, which has given special attention to emotions and needs. Pragmatic and significant experiences were explained in detail including the emotions elicited by the products that enhanced those experiences and the needs fulfilled.

New knowledge about the preference of experience by users and the preference of elicitation by designers of a set of twenty-five positive emotions was developed. The underlying reasons for preferring the emotions were also reported and compared between the two groups. In design research there are few studies that have contrasted the perspectives of users and designers. The results of this study can be used to guide designers in the selection of the positive emotions that they can evoke by product design. Scholars can also use this information to investigate in detail some of the most preferred emotions and help designers deal with the difficult task of designing emotions.

A set of twenty-five positive emotions was classified into *exciting*, *median arousal* and *calm* to characterise their arousal dimension. The same set was also studied in terms of its pleasantness and the emotions were classified into *very pleasant*, *mildly pleasant* and *pleasant*.

A novel set-up to study emotions was implemented and tested with positive results. This set-up is a new option for design researchers to capture both recall and immediate experiences of emotions elicited during human-product interactions. Future studies can employ this set-up to investigate other positive emotions.

New and detailed characterisations of anticipation, confidence, inspiration and sympathy were developed investigating user experience with products. These characterisations differ from previous work because we identified the involved appraisal structures, thought action tendencies, and eliciting conditions for each of the four studied emotions.

Design tools to elicit anticipation, confidence and inspiration were developed and tested as part of a three-step design process. The tools provide relevant information about emotions that needs to be contextualised in relation to the project that designers are working on. This approach to support the elicitation of positive emotions is new compared to previous work as it is based on building a generic knowledge base rather than creating it as part of a specific design project. In addition, aspects that explain designers' positive evaluation of the tools were identified. In particular, the research found that the tools are useful to develop new ideas and that designers can use them to contrast their personal understanding of emotions.

IV

Thesis structure

This thesis consists of an introduction and seven chapters.

Chapter one presents a review of theories, models and frameworks of user experience, providing a foundation for this research.

Chapter two presents an investigation of how users experience 'great' products.

Chapter three presents an investigation of users' preference for and frequency of experience of twenty-five positive emotions. It also presents designers' preference and perceived difficulty of elicitation of twenty-five positive emotions.

Chapter four presents an investigation of pleasantness and arousal of twenty-five positive emotions.

Chapter five presents an in-depth investigation of anticipation, confidence, inspiration, and sympathy.

Chapter six presents research to develop and test tools to elicit positive experiences.

Chapter seven presents the general discussion and conclusions of this research project, as well as, its contributions and potential areas for future research.

Chapter one: user experience in product design

***

The artificial world that humans have built around themselves is made of a large variety of products and systems. During recent years research in new product development has tried to understand how humans experience such world. The research field that is concerned with understanding human lived experiences of products is known as user experience. It focuses on the interactions between people and artefacts that occur in a specific moment and place, and it gives emphasis to qualities typically associated with the emotional and aspirational levels of a person such as human hopes, fears, dreams, feelings, and self-image (Jordan, 2003 p.XII). In this way user experience distinguishes itself from the tool-oriented approach which has dominated the development of products (Jordan, 2003 p. XII). In terms of design practice a better understanding of the above qualities is needed, in order to consider the whole picture, which the tool-oriented approach does not offer, and to provide positive experiences through products. Among others, such understanding may help capture potential reasons for product dissatisfaction and returns (Den Ouden, Yuan, and Sonnemans, 2006) as well as building long-lasting relationships between product makers and users (Kujala et al., 2011), which industry is much interested in (Law et al, 2009). Research in user experience aims at extending the knowledge that designers have and could use to design for experiences.

Over recent years the body of literature on user experience has constantly increased delivering new theories, models, and frameworks. However, this literature is disjointed and it fails to provide a clear and concise overview of the most influential aspects of user experience. Unconnected theories represent a drawback for research because complementary or overlapping ideas from different authors are not linked (Crilly, Maier, and Clarkson, 2008). Two negative outcomes of this situation are that some concepts may be overlooked and relevant features may be

absent from a general perspective (Crilly, Maier, and Clarkson, 2008). The objective of this chapter is to analyse, compare and synthesise different perspectives on user experience. With this work we will contribute to the field of design research by connecting existing knowledge and offering an overview of the state of the art. This review can help define a general framework as advocated by Law et al (2009). It can also result in a useful introduction to user experience for non-experts and a platform for discussion of key issues for experts.

1.1 *User Experience*

In order to address the research objective, eleven theories, models and frameworks concerned with user experience were reviewed, see *Table 1.1*. These were taken from the fields of product design, interaction design, and social psychology. When selecting this literature it was fundamental to capture a broad view. This review includes only literature that clearly describes its scope, defines the concept under investigation, and presents its constituent elements. Equally relevant, these perspectives focus on user experience resulting from interactions with artefacts, products, or technology. It was decided to include two perspectives from social psychology because they provide empirical data that is relevant for understanding human experience. These perspectives capture valuable insights that user experience can rely upon to define its most important qualities. This is because the concept of user experience is embodied in human experience. In synthesising the theories, models, and frameworks, no attempt was made to favour any single approach. The intention was to identify issues that scholars have pointed out as relevant for user experience.

1.1.1 *Definitions and frameworks of user experience*

For each selected perspective a definition of user experience is provided in *Table 1.1*.

	Definitions
1	"Basically, user experience refers to the experience that a person gets when he/she interacts with a product in particular conditions". (Arhippainen, L. & Täht, M., 2003: p 27)
2	"Product experience refers to an experience that is affective". They explain that "the term affect, or affective state, is generally used to refer to all types of subjective experiences that are valenced, that is, experiences that involve a perceived goodness or badness, pleasantness or unpleasantness". In addition, they explain that "valence uses the concept of core affect to differentiate between affective states". In conclusion, they define "product experience as a change in core affect that is attributed to human-product interaction". (Desmet and Hekkert, 2007: p 58-59).
3	"Experience emerges from the intertwined works of perception, action, motivation, emotion, and cognition in dialogue with the world (place, time, people, and objects). User experience is not much different from experience per se. It simply focuses our interest on interactive products (as opposed to, for example, other people) as creators, facilitators and mediators of experience". He suggests "five aggregates of experience: subjective, holistic (it comprises of perception, action, motivation, and cognition), situated (experiences are in a dialog with the world at a particular place and time), dynamic (extended over time) and positive (worthwhile or valuable)" (Hassenzahl, 2010: p 4-9).
4	"User experience is the consequence of a user's internal state, e.g. predispositions, expectations, needs, motivation, and mood; the characteristics of the designed system e.g. complexity, purpose, usability, and functionality; and the context (or the environment) within which the interaction occurs, e.g. organisational/social setting, meaningfulness of the activity, and voluntariness of use" (Hassenzahl and Tractinsky, 2006: p 95).
5	"The subjective product experience is the awareness of the psychological effects elicited by the interaction with a product, including the degree to which all the senses are stimulated, the meanings and values people attach to the product, and the feelings and emotions that are elicited" (Hekkert and Schifferstein, 2008 : p 2).
6	"User experience focuses on the interactions between people and products, and the experience that results. This includes all aspects of experiencing a product — physical, sensual, cognitive, emotional, and aesthetic" (Forlizzi & Battarbe, 2004: p 261).
7	"User experience focuses on the interaction between a person and something that has a user interface (i.e. product, system, object)". In addition, they maintain that "user experience is dynamic, context-dependent and subjective" (Law et al, 2008: p 727).
8	"User experience is a phenomenon concomitant with human-technology interaction, and heavily influences the user's appraisal of the system. It can be described in terms of distinct components interacting with each other in a particular way" (Mahlke & Thuring, 2007: p 916).
9	They suggest "an approach to interpret the relationship between people and technology in terms of the felt life and the felt or emotional quality of action and interaction" (McCarthy and Wright, 2004: p 12). They believe that "experience points to the emotional and sensual quality of experience". They also recognize that "the feeling-life does not begin and end with the immediate quality of an experience, rather it extends across space and time to the sense we make of experience in terms of our selves, our culture, and our lives" (McCarthy and Wright, 2004b: p 42).
10	They discuss "human experience" which is defined as any of the contents of consciousness: thoughts, feelings, sensations" (Heknert, Schmidt, and Csikszentmihalyi, 2007: p 4).
11	They believe that experience is made of five aggregates. First, 'forms' are related to the body and the physical environment. Second, 'feeling sensations' are related to the feeling tone, classifiable as pleasant, unpleasant, or neutral, and as either bodily feeling or mental feeling. Third, 'perception/impulses' are related to root impulses –passion/desire (toward desirable objects), aggression/anger (toward undesirable objects), and delusion/ignoring (toward neutral objects). Fourth, 'dispositional formations' refer to habitual patterns of thinking, feeling, perceived, and acting, e.g. personality traits. Finally, 'consciousness' is the mental experience that goes with the other four components; it always refer to the dualistic sense of experience in which there is an experiencer, and object experienced, and a relation (or relations) binding them together (Varela et al 1991 p 63-68).

Table 1.1. *Definitions of user experience from the literature review*

As it can be seen in *Table 1.1* the definitions vary in the level of explanation with some being very concise and others more detailed. This can be the result of the publication in which the definitions are presented. For example Hassenzahl (2010) and McCarthy and Wright (2004) have introduced their perspective in books, which demand more thorough definitions. Another aspect to note is that the definitions indicate the qualities of user experience and its elements. For example, the definitions indicate elements of user experience like the focus on products or objects, the relation or interaction between the human and products, and aspects that users perceive from the experience such as emotions or stimulation of the senses. Although some definitions do not explicitly mention these aspects, they can often be inferred. A more detailed analysis of these definitions is presented in *section 1.1.2*. It is central for the development of this research to present now the frameworks proposed by seven of the eleven authors reviewed.

Arhippainen and Täht (2003) have represented the key elements of user experience in the framework in *Figure 1.1*. These elements are: the user (e.g. values, expectations, prior experiences, etc.), the product, (e.g. functions, size, weight, etc.), the context (e.g. time, place, accompanying persons, etc.), and the social and cultural factors. All these elements influence the experience evoked through the user-product interaction.

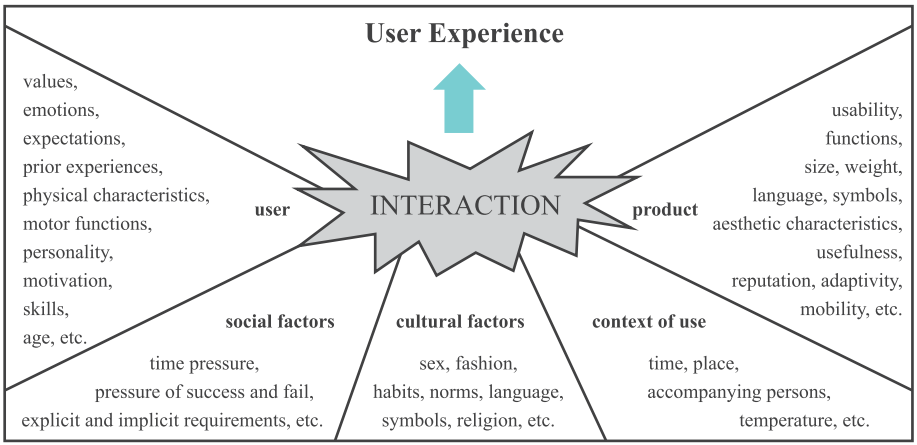


Figure 1.1. *Arhippainen and Täht (2003) user experience factors*

Desmet and Hekkert (2007) have argued that product experience is the entire set of effects that is elicited by the interaction between a user and a product, including the degree to which users' senses are gratified (aesthetic experience), the meanings that users attach to the product (experience of meaning) and the feelings and emotions experienced (emotional experience), see *Figure 1.2*. They have also pointed out that in order to understand emotional responses to human-product interactions, one must understand the users' concerns given the context in which they interact with the product.

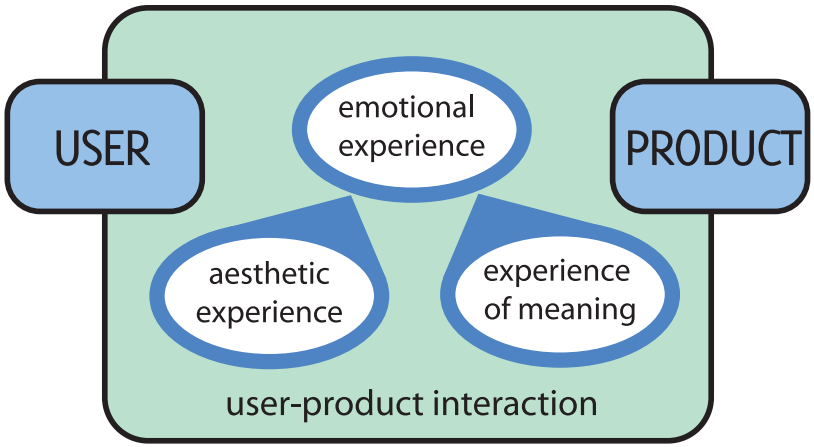


Figure 1.2. *Desmet and Hekkert (2007) framework of product experience*

Hassenzahl (2010) has introduced the three-level hierarchy of goals in *Figure 1.3*. Be goals are self-referential, e.g. people want to be competent, admired, autonomous and close to others. Do goals are concrete outcomes, e.g. making a telephone call or typing a report. Motor goals are the actual step, e.g. when making a telephone call it consists of pressing buttons and reading single letters from a display. Hassenzahl acknowledges the characteristics of the users through be and do goals, while the role of interaction is acknowledged through motor-goals. Finally, the context is part of his framework through the properties of the 'situated' experience.

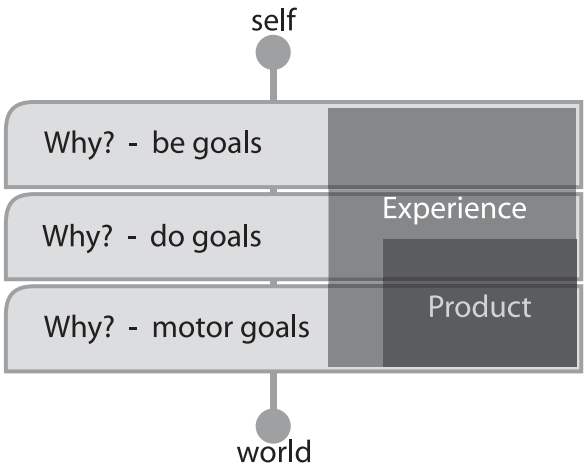


Figure 1.3. *Hassenzahl (2010) model of a three level hierachy of goals*

Hekkert and Schifferstein (2008) have proposed the model of human-product interaction in *Figure 1.4*. They argue that experience and interaction are fully intertwined and in order to explore people's experiences of products, it is needed to thoroughly understand the constituents or building blocks of human–product interaction. They also mention that the experience-oriented approach can be investigated from three perspectives: the human beings with their systems and skills; the interaction itself with its different components; and the product (domain) with its specific properties.

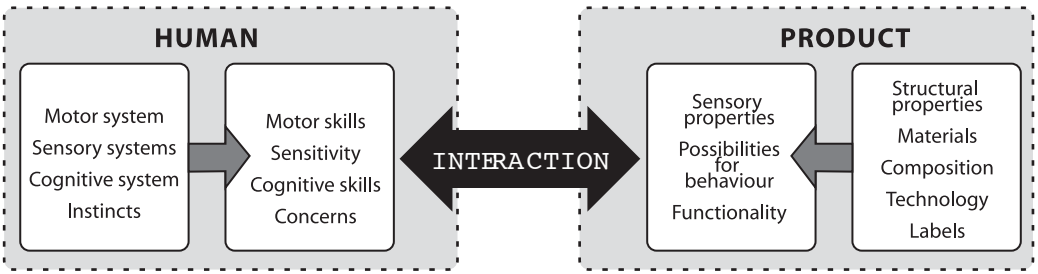


Figure 1.4. *Hekkert and Schifferstein (2008) model of human-product interaction*

Forlizzi and Battarbee (2004) have introduced a framework that describes user-product interactions (e.g. fluent, cognitive, and expressive), and dimensions of experience (e.g. experience, an experience, and co-experience), see *Figure 1.5*. They have also stressed the importance of experiences in the context of social interaction, in which people interpret particular events and create meaning.

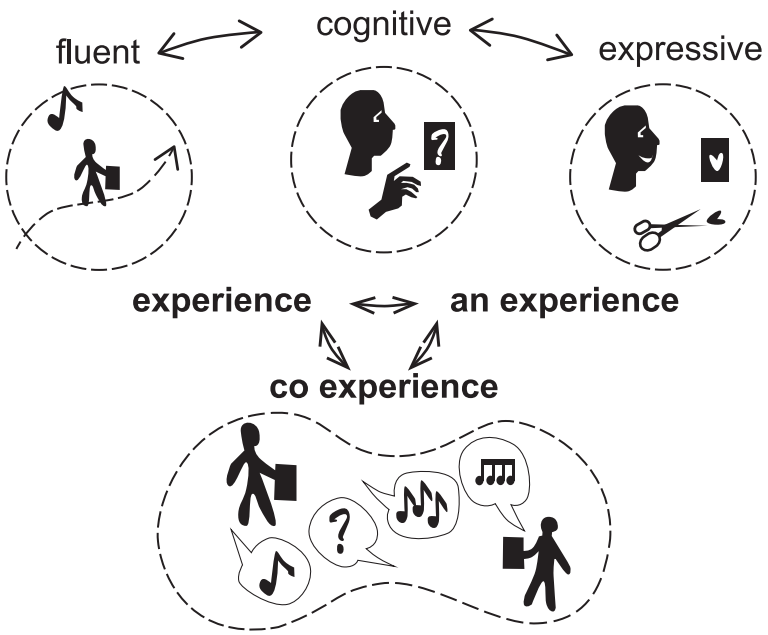


Figure 1.5. *Forlizzi and Battarbee (2004) model of the dynamics of experience in interaction*

Mahlke and Thüring (2007) have argued that user experience is gained through the user's interaction with the system, see *Figure 1.6*. Usually, this interaction aims at accomplishing a particular task, takes place in a certain context and extends over a limited period of time. In this context, features of the user – such as knowledge or skills – as well as features of the system – such as functionality and interface design – affect the interaction and determine its major characteristics.

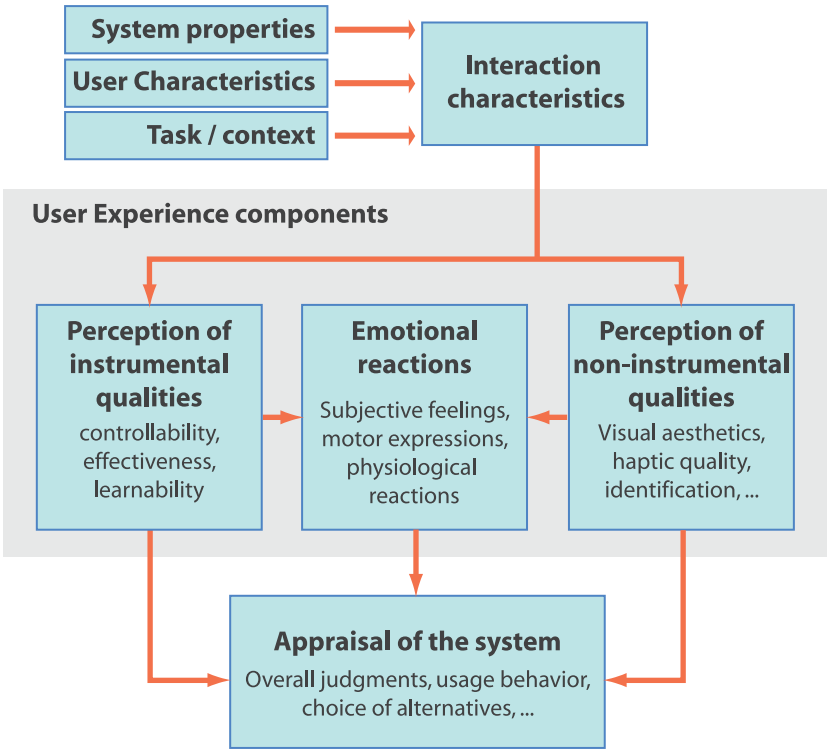


Figure 1.6. *Mahlke and Thüring (2007) components of user experience*

McCarthy and Wright (2004a) have presented four threads of experience: sensual, emotional, compositional and spatio-temporal, see *Figure 1.7*. These are not fundamental elements of experience but ideas that can help designers and scholars think more clearly about technology as experience. The sensual thread is concerned with the sensorial engagement with a situation. The emotional thread is concerned with the judgments of value that users ascribe to products based on their needs and desires. The compositional thread is concerned with relationships between the parts and the whole of an experience, e.g. the characteristic of a mobile phone and the relations between these, the user and the setting. The spatio-temporal thread

distinguishes between public and private space, and recognizes comfort zones and boundaries between the self and others, or between present and future. McCarthy and Wright (2004a) have also presented six sense-making processes called anticipating, connecting, interpreting, reflecting, appropriating, and recounting, which explain how people make sense of experience.

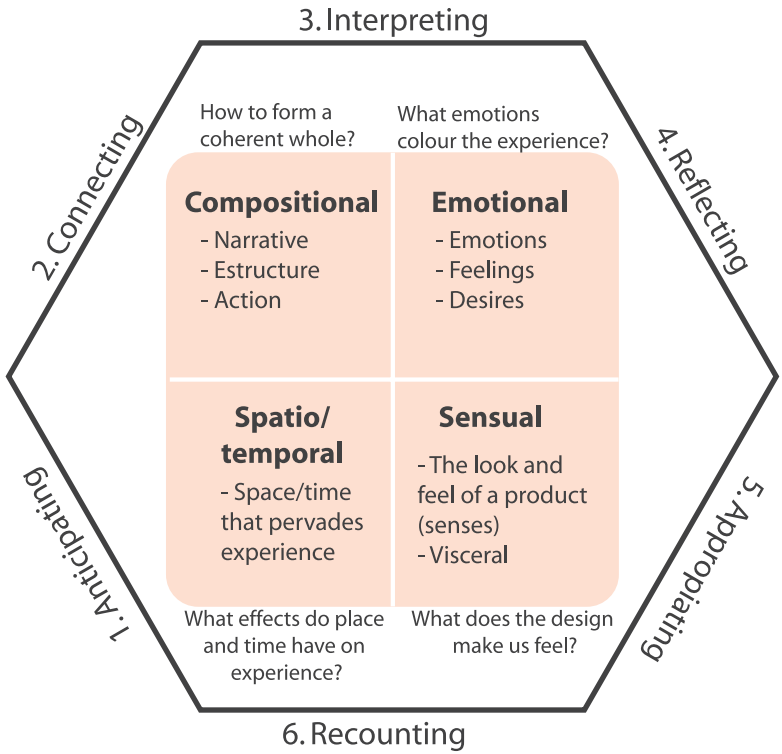


Figure 1.7. *McCarthy and Wright (2004a) model*

The seven frameworks reviewed above represent the principal attempts to define the key elements of user experience and their importance. It can be seen that some frameworks show more structure than others. In addition, there are some that focus on specific issues and explain them in detail (Desmet and Hekkert, 2007; Forlizzi

and Battarbee, 2004), and others that try to offer a more comprehensive view of user experience (Arhippainen and Täht, 2003; Hassenzahl, 2010; McCarthy and Wright, 2004a; Mahlke and Thüring, 2007; Hekkert and Schifferstein, 2008). The frameworks often use different terms to refer to similar concepts, e.g. interaction in comparison with motor and do goals. It is also interesting to observe that interaction emerges in all the models as the medium to gain the experience.

Based on the review of the definitions and the frameworks two main aspects of user experience were identified. The first aspect was termed *aggregate* of user experience after Varela et al (1991 p. 64) and it refers to properties of user experience (see also Hassenzahl, 2010). The second aspect was termed *constituent element* of user experience and it refers to components that determine user experience. Not all scholars make an explicit distinction between aggregates and constituent elements. For example, Arhippainen and Täht (2003) define user experience as the one that a person gets when interacting with a product in particular conditions. Thus, they acknowledge the 'subjectivity' of experience, which we class as an aggregate. In addition, in their framework they also point out the 'dynamic' aspect of experience, which we class as an aggregate. The constituent elements are: the person, the product, the context, and the interaction. The aggregates and constituent elements are explained in detail in *sections 1.1.2* and *1.1.3*.

1.1.2 *Aggregates of user experience*

During data analysis five aggregates or properties of user experience emerged, namely subjective, conscious, emotional, interconnected, and dynamic. These aggregates are supported by the majority of the perspectives reviewed in this research, see *Table 1.2*.

Authors	Aggregates					
	Subjective	**Conscious**	**Emotional**	**Interconnected**	**Dynamic**	
					An experience	**Experiencing**
Arhippainen and Taht (2003)	✓	?	✓	✓	✓	✓
Desmet and Hekkert (2007)	✓	✓	✓	✓	?	✓
Hassenzahl (2010)	✓	✓	✓	✓	✓	✓
Hassenzahl and Tranctinsky (2006)	✓	✓	✓	✓	✓	✓
Hekkert and Schifferstein (2008)	✓	✓	✓	✓	✓	✓
Forlizzi and Battarbee (2004)	✓	✓	✓	?	✓	✓
Law et al (2009)	✓	✓	✓	?	✓	✓
Mahlke and Thuring (2007)	✓	✓	✓	✓	?	✓
McCarty and Wright (2004)	×	✓	✓	✓	✓	✓
Hektner et al (2007)	✓	✓	✓	✓	✓	✓
Varela et al (1991)	✓	✓	✓	✓	?	✓

Table 1.2. *Aggregates of user experience*
(Legend: ✓agree; ×*disagree;* ?unknown)

The five aggregates are explained in detail the following sections.

Subjective

Experience is influenced by feelings, tastes and thoughts resulting from our personal way of living an event. As a consequence, each person lives his or her own experience and determines what is significant about it. There is a general consensus between scholars that individuals evaluate their own experiences from a subjective perspective (Arhippainen and Täht 2003; Desmet and Hekkert, 2007; Hassenzahl, 2010; Hekkert and Schifferstein, 2008; Law et al, 2009; Heknert, Schmidt and Csikszentmihalyi, 2007 and Varela, Thompson, and Rosch, 1991). Even though Mahlke and Thüring (2007) make no specific statement about the subjectivity of experience, their model is presented in terms of user and subjective feelings. Forlizzi and Battarbee (2004) point out that there are different dimensions of experience. Among these they argue that experiencing is a constant stream of 'self-talk' that happens when we interact with products, hence 'self-talk' is a subjective action. In contrast, McCarthy and Wright (2004, p. 85) argue that experience does not refer to subjective states, but to the irreducible totality of people acting, sensing, thinking, feeling, and making meaning in a setting, including their perception and sensation of their own actions.

Conscious

Experience is conscious because the user is aware of what he or she is living, feeling, and sensing, as a result of the interaction with a product. Scholars tend to agree that when users are experiencing an artefact they are in a state of consciousness (Hassenzahl, 2010; Forlizzi and Battarbee, 2004; Desmet and Hekkert, 2007; and Law and colleagues, 2009) or awareness (Hekkert and Schifferstein, 2008). Arhippainen and Täht (2003) do not explicitly mention consciousness in their work. However, they discuss it as part of data collection suggesting the use of interviews to gather remembered or immediate experiences and observational research to gather non-verbal data. Varela et al (1991 p. 68), instead, explain that consciousness contains all the aggregates of experience. There is *contact* between the mind and the object; a specific *feeling* tone of pleasantness, unpleasantness, or neutrality; a discernment of the object; an *intention* towards the object; and *attention* to the object. The current focus on conscious events can be attributed to user experience being in the early stages of its development, as well as, to the philosophical stands employed by the scholars, e.g. pragmatism, phenomenology, and action theory.

Emotional

There is a general agreement between scholars on the relevance of emotions in user experience. All experiences have some kind of feeling tone regulated by human emotions (Varela, Thompson, and Rosch, 1991). Emotions are at the heart of experience and they colour it (Hassenzahl, 2010; Forlizzi and Battarbee, 2004; McCarthy and Wright, 2004). Without emotional engagement, experience would lack unity and fail to be an experience (McCarthy and Wright, 2004). Emotions, motivation, and cognitive processes coexist and contribute to experience in every moment of our life (Hektner, Schmidt, and Csikszentmihalyi, 2007). The user brings to the experience their values, emotions, expectations and prior experience (Arhippainen and Täht, 2003). Desmet and Hekkert (2007) have acknowledged the relevance of emotions in user experience by making them one of the three elements of their product experience framework. Similarly, Mahlke and Thüring (2007) support their model by assessing, on the one hand, the user's perception of instrumental and non-instrumental qualities of human-product interaction and, on the other hand, the users' emotional reactions. In addition, the relevance of emotions is apparent in a number of models that have been recently developed to explain their role in product design (Jordan, 2000; Desmet, 2002; Hassenzahl, 2003; Norman, 2004; and Rafaeli and Vilnai-Yavetz, 2004).

Interconnected

User experience emerges from the interplay of cognition, affection, sensory input, behaviour, and all the other systems that humans rely on. Therefore, it has to be understood, researched, and explained making reference to the human as a whole, not its constituent elements. Hassenzahl (2010) supports this view and believes that experience is explicable only by reference to the whole. Hekkert and Schifferstein (2008) state that humans are biologically equipped with a number of systems that make it possible for them to interact with their environment: a motor system to act upon the environment; sensory systems to perceive changes in the environment; and a cognitive system to make sense of the environment and to plan actions. In a similar line of thought Mahlke and Thüring (2007) describe user experience in terms of distinct components interacting with each other in a particular way. Similarly, Arhippainen and Täht (2003) represent visually this interconnection in their

framework. Finally, Desmet and Hekkert (2007) also argue that the understanding of affective experience requires an approach that explains how behaviour, cognition, and experience are interrelated as a result of human-artefact interaction.

Dynamic

Experience is dynamic, always evolving, scalable, cumulative, and provisional (Hassenzahl, 2010; Forlizzi and Battarbee, 2004; McCarthy and Wright, 2004; Varela, Thompson and Rosch, 1991; Hektner, Schmidt, and Csikszentmihalyi, 2007). More so, it develops over time and, as it does, it enriches permanently. To illustrate the dynamic nature of user experience we now explain in detail the difference between the concepts of: 1) experience, 2) experiencing, and 3) accumulative experience.

Experience refers to the bulk of experiences that we gather in life. These emerge from the interplay of human characteristics, e.g. action, perception, motivation and emotions, and are the result of a dialog with the world at a particular place and time (Hassenzahl, 2010). McCarthy and Wright (2004) call experience the general stream of experience; this stream is the space in which an experience connects with other experiences. Thus, experience is the 'space' that embodies the always changing and evolving quality of experience (Hassenzahl, 2010; McCarthy and Wright (2004). Although we are always engaged in experience, user experience is interested in the dialog that happens when we interact with artefacts.

Experiencing refers to the specific moment in which the user-product interaction occurs. It is the period in which a user makes sense of the experience. It has also been referred to as the constant stream of 'self-talk' that happens when we are interacting with products (Forlizzi and Battarbee, 2004) or the here and now (Desmet and Hekkert, 2007).

Accumulative experience is the sum of experiencing episodes in which the users live the experience. It contributes to forming an overall evaluation of a product over time, e.g. from the purchase day until the present. For example, based on previous experiences with Sony products, users may assume that new Sony products are easy to operate without evaluating the ease of operation of the specific product at hand (Creusen and Schoormans, 2005). McCarthy and Wright, 2004 argue that when an experience runs its course to fulfilment, it is integrated within the general stream of experience, and at the same time, demarcated from other experiences. Similar

ideas are discussed also in the work about past experiences by Hektner, Schmidt, and Csikszentmihalyi (2007). They say that after more than a century, advances in psychology and neurobiology show that we memorize only parts of an experience, we interpret them and we associate them with previous similar situations. On an empirical basis, Arhippainen and Täht (2003) mention that to gather data for the long-term use, surveys, diaries and storytelling have been regarded as an effective way to get information about user experience. The relationship between experience, experiencing and an accumulative experience is presented in *Figure 1.8*.

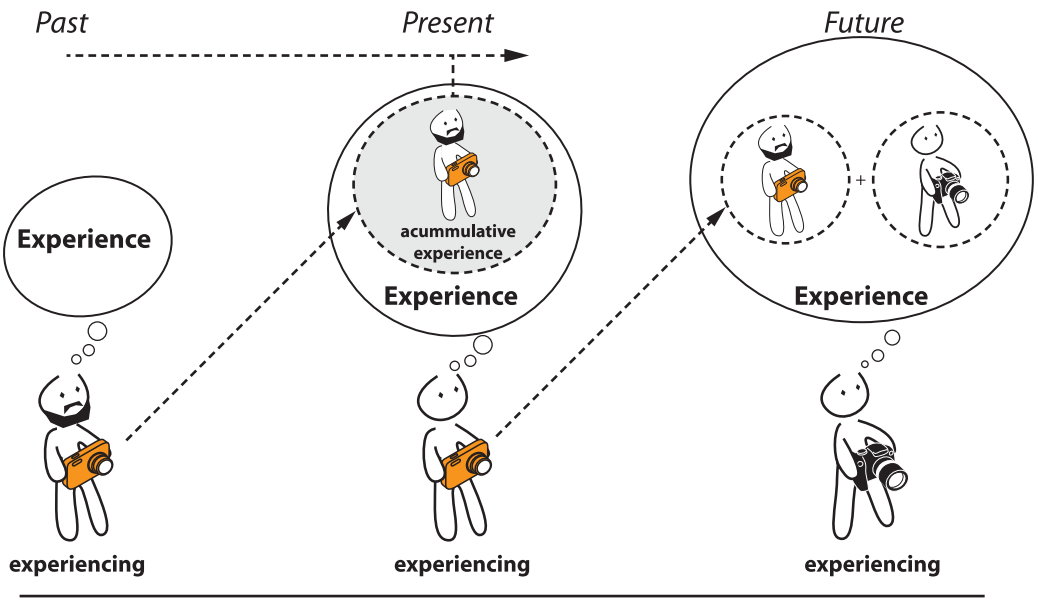


Figure 1.8. *The relationship between experience, experiencing and accumulative experience*

Experience is always there, embodying and affecting experiencing and accumulative experience.

Experiencing an artefact impacts on current and future interactions. For example, by interacting with a digital camera the knowledge gained will help the user interact with other cameras in the present and future. 'Experiencing episodes' grow accumulative experience.

An accumulative experience also impacts on current and future interactions. For example, a user may have had bad experiences with a camera due to lack of knowledge about its functionality. However, after learning all the functions of the camera and developing a bond with it, the perception of the user can evolve as a provider of a pleasant experience; and vice versa.

Experiencing and accumulative experiences continually evolve. Dewey (in McCarthy and Wright, 2004) calls this the principle of continuity of experience, which means that every experience takes up something from those which have gone before and modifies the quality of those which come after.

1.1.3 *Constituent elements of user experience*

Analysing the definitions in *Table 1.1* and the frameworks, it was identified that the debate has focused on the following four constituent elements of user experience: the user, the artefact, the interaction, and the context. These elements are acknowledged by the majority of the perspectives reviewed in this research, see *Table 1.3*.

Authors	Elements			
	User	**Interaction**	**Artefact**	**Context**
Arhippainen and Täht (2003)	User	Interaction	Product	Context of use, social and cultural factors
Desmet and Hekkert (2007)	User	Interaction	Product	Context
Hassenzahl (2010)	User	See interaction as part of 'Dynamic' element	Interactive products	See context as 'Situated' and 'Dynamic' elements
Hassenzahl and Tranctinsky (2006)	Human perspective	See interaction as part of 'Situatedness' or 'Context'	Products or technology use	Context or environment
Hekkert and Schifferstein (2008)	People	Interaction	Products	Context or environment
Forlizzi and Battarbee (2004)	User or people	Interaction	Product and interactive systems	Context or environment
Law et al (2009)	User	Interaction	Product, systems, and objects	Context
Mahlke and Thuring (2007)	User	Interaction	Human-technology interaction	Context
McCarthy and Wright (2004)	Person or people	See interaction as part of the 'Compositional Thread'	Technological artefacts	See context as part of 'Spatio-temporal thread'
Hektner et al (2007)	People	They acknowledge that 'activities' that occur in a context shape human experience	Not relevant	Context or environment
Varela et al (1991)	Person	They acknowledge that there is a relation that 'binds' together an experiencer and an object experienced; part of 'Consciousnesses'	Forms or objects	Context

Table 1.3. *Constituent elements of user experience*

The four elements are explained in detail in the following sections.

The user

Existing research on user experience has referred to the human element through the following terms: user, person (or people) and human perspective, see *Table 1.3*. In this research, the term 'user' was selected to refer to people and consumers who interact with products. This decision was made to be consistent with the mainstream view in the field of new product development (Crilly, 2010).

User experience is not a property of the product but the outcome of human-product interaction and therefore it is dependent upon the user (Desmet and Hekkert, 2007). Consequently, there is a large body of knowledge that focuses on the user. For example, there are studies that have focused on how to: 1) stimulate the senses to enhance user experience (Fenko, Schifferstein and Hekkert, 2010; Schifferstein, 2004; Schifferstein and Desmet, 2007); 2) identify relevant expectations and needs in pleasant experiences (Hassenzahl, Diefenbach and Goritz, 2010); and 3) understand the mechanisms that influence how users develop bonds with products (Mugge, Schifferstein and Schoormans, 2010). Equally relevant is to develop an understanding of the role and impact of emotions on user experience.

The interaction

The theories, models and frameworks reviewed in this article always acknowledge a relationship between the human and the external world through interaction. Interaction is distinct from activity, task, or action. An action does not require reciprocality, whereas the result of an interaction does (Susi and Ziemke, 2001; McCarthy and Wright, 2004). A task is something that has to be done, whereas interaction does not imply completing a task. Finally, an activity is described as doing in order to transform something. Interaction does not necessarily imply a transformation.

In the field of social psychology interaction was defined as the reciprocal action of an individual that may influence and modify the behaviour of another individual (Susi and Ziemke, 2001). We define interaction as the action accomplished by a user on an artefact that influences or modifies his or her motor, perceptive, cognitive, and affective systems. It is a mean not the fulfilment of a purpose. To clarify the idea of interaction we draw upon an analogy already adopted by Varela, Thomp-

son, and Rosch (1991 p. 68) regarding mental factors. These authors have stated that mental factors are the relations that bind the consciousness to its object. In a similar way, interaction can be seen as the set of relations that bind the user and the artefact (Arhippainen and Täht, 2003; Desmet and Hekkert, 2007; Hekkert and Schifferstein, 2008; Forlizzi and Battarbee, 2004; Mahlke and Turing, 2007; Law and colleagues, 2009). Furthermore, the experience does not only result from the interaction, it accompanies and guides the experience, and thus affects it (Hekkert and Schifferstein, 2008).

Forlizzi and Battarbee (2004) suggest three interaction modes: fluent interaction (automatic and skilled), cognitive interaction (dependent on user's reasoning), and expressive interaction (help form a relationship to the product). Hassenzahl (2010) acknowledges the role of interaction through motor goals. McCarthy and Wright do not refer to interaction itself but it seems that they address it in the sensual thread through engagement with a product, and in the compositional thread, which is concerned with relationships between the parts and the whole of an experience. These views, which are limited as much more work exists on interaction, have led us to class interaction as a constituent element. This differs from the following scholars who see interaction as part of the context (Hassenzahl and Tractinsky, 2006; Hassenzahl, 2010; McCarthy and Wright, 2004; and Heknert, Schmidt and Csikszentmihalyi, 2007).

The artefact

Current research on user experience has referred to the artefact through the following terms: product, object, item and system, see *Table 1.3*. In this dissertation the terms artefacts and products are used interchangeably. We acknowledge, however, that term artefact is more general and it is frequently used across the disciplines that are interested in new product development (Crilly, 2010). In plain words an artefact is an object made by a human being that performs technical and non-technical functions, e.g. instrumental, symbolic and aesthetic. There is empirical evidence suggesting that users recognise and differentiate between the aesthetic, the social, and the technical function (Tractinsky and Zmiri, 2006; Rafaeli and Vilnai-Yavetz, 2004; Mahlke and Thuring, 2007; Lindgaard, 2007; Hassenzahl, 2008; Crilly, 2010).

Technical functions are related to what the artefact is meant to do, e.g. a glass

contains water, scissors cut paper, and a car transports users (Crilly, 2010). Symbolic functions are social-status functions (Crilly, 2010) and depend on the collective understanding and agreement of the agents that make up the relevant community. Moreover, symbolic functions are related to users' manner of thinking of and talking about artefacts (Jordan, 2000; Hassenzahl, 2003; Janlert and Stolterman, 1997; Govers, and Schoormans, 2005; Ortíz Nicolás et al, 2011). Aesthetic functions are generally used to refer to a response or reaction of the user to an artefact manifested through the senses. Each of the senses contributes to our perception of an artefact and whether it is delightful, pleasing, or elicits feelings of attraction or beauty in us (Hassenzahl, 2008; Bloch, Brunel, and Arnold, 2003; Hekkert, 2006). In general, artefacts influence human experience, which is shaped by the tools and sign systems we use (Susi and Ziemke, 2001); more specifically, artefacts model user experience through the functions that they perform.

The context

When users interact with an artefact they are not only influenced by it but also by the context of the interaction. Scholars agree on the important role of the context in user experience. In the field of social psychology the context is defined as an unfixed set of surrounding conditions with a wider dynamic process of which the cognition of the individual is only a part (Hutchins in Susi and Ziemke, 2001). Forlizzi (2007) indicates that context is understood as a complex, dynamic set of factors, e.g. social, historical, and cultural. However, there are still many gaps on what dynamic factors relevant for user experience are part of the context. Few of the reviewed frameworks explain in detail the role of context, i.e. Hassenzahl, 2010; McCarthy and Wright, 2004. Others acknowledge its relevance but they do not discuss it in detail. To overcome this limitation we rely upon additional literature. From the reviewed models as well as the work that has been carried out in product development five sub-elements of the context were identified as follows: physical, social, cultural, situational, and temporal.

The physical context is the location where the interaction occurs, e.g. an office, a lab or a living room, and the surroundings brought to the experience, e.g. the temperature, the weather, or the light conditions. It also considers the relationship between artefacts, e.g. in the case of a home cinema system the physical context

includes the relationship between the DVD player, the speakers, and the TV. A case study that illustrates how an artefact influences its physical space can be found in Forlizzi (2007a).

The social context refers to the effect that social interaction has on user experience. Forlizzi (2007) has pointed out that there is little knowledge about what happens when groups of users interact with or through a product, evoking social behaviour. Despite this lack of understanding, Battarbee and Koskinen (2008) claim that interacting with other people is the basis of making sense of experiences at all. None of the reviewed frameworks deny the relevance of the presence of other people in experiencing artefacts. Many aspects influence user experience and it is difficult to define one single element as the basis to make sense of experiences.

The cultural context is related to the conventions that a group of people share e.g. values, languages, norms, and emotions. Cross-cultural studies for instance have shown that people from different cultures may not hold the same values (Hofstede, 1991). Values have an influence on user experience. For example, in an individualistic culture people may be more interested in products that enforce the self. Similarly, if users consider important to preserve nature they will enjoy consuming eco-products. Another aspect in which culture impacts on user experience is symbolic functions (Krippendorff, 2006; Crilly, 2010). If the meaning of certain objects is shared among the members of a group or culture, it allows those members to communicate their identity through products (e.g., Belk, 1988). Culture also impacts the way in which people: 1) assess questionnaires related to user experience (Fenko et al, 2010a); 2) experience emotions, e.g. pride (Tracy and Robins, 2007); and 3) categorise colours (Varela et al, 1993).

The situational context is related to the set of circumstances in which one finds himself or herself during the experience. Different researchers have argued that situational factors play a role in experience, e.g. work-state and play-state (Schmidt, Rich, and Makris, 2000; Hassenzahl, 2010). Similar situations have been reported in the field of user experience, i.e. goal-mode and activity-mode. For example, the overall judgment differed when two groups of people were induced in one of the two situations and interacted with the same website (Hassenzahl, Kekez, and Burmester, 2002, for a more recent example see Yoon and Desmet, 2012). Desmet and Hekkert (2007) also discuss the role of the situation and their influence in

human-product interaction. They mention that in stressful situations people may use additional force when assembling a closet. In more relaxed situations people may explore various options when performing the same task.

1.2 *A framework for user experience*

Based on the review and analysis of previous literature a new framework of user experience is proposed and presented in *Figure 1.9*. The framework is complemented with the following definition:

User experience is the subjective, conscious, emotional, interconnected and dynamic encounter that a user has with an artefact through interaction, occurring in a particular context and time.

The framework presents five aggregates or properties of user experience, and model it using four constituent elements. The framework is now introduced starting from the outer towards the inner elements, see *Figure 1.9*. To begin with it can be seen that user experience is part of human experience and its aggregates are introduced, namely subjective, conscious, emotional, interconnected, and dynamic. User experience is subsequently broken down into its constituent elements, namely, the user, the artefact, the interaction and the context. Each of these is then further detailed by means of a set of sub-elements, e.g. the context is distinguished into physical, social, situational, cultural and temporal. In real life, however, it is difficult to make a distinct separation of the constituent elements because user experience is interconnected in principle. The framework is a representation of a complex and vivid phenomena: the experiences that users gain when interacting with products.

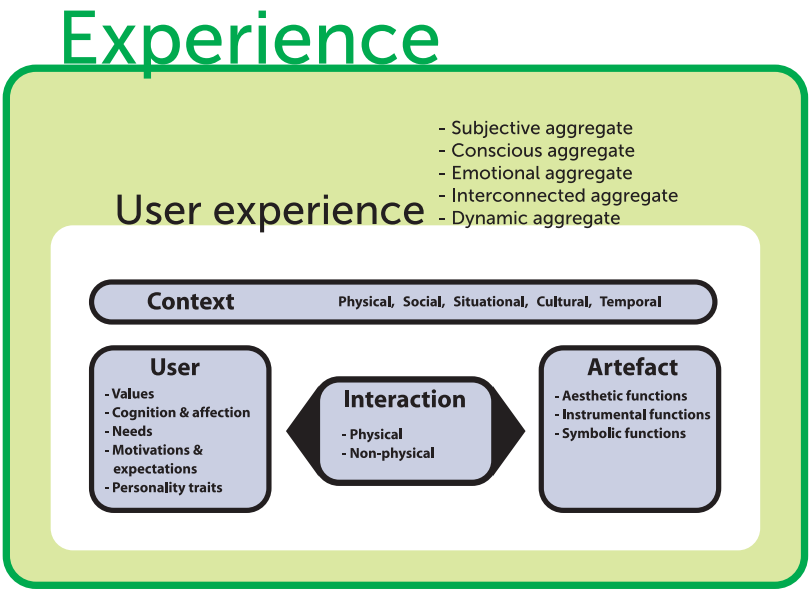


Figure 1.9. *The resulted framework from the synthesised work*

To show how the framework explains user experience we now use an example, which reports the experiences that John, a fictional character, has had with his digital camera.

John has owned his digital camera for some years, and he is satisfied with it but this is his *subjective* experience as not all his friends share it. Taking pictures demands him to have *consciousness* of the objects and people that he shoots at. He intentionally adjusts the functions of his camera and frame the scene that he wants to photograph. His motor, cognitive and affective systems are involved, and his experience is *interconnected*. While shooting, he feels excited and nervous about the resulting photo. His emotions also influence what he is going to photograph. After having owned the camera for a while he has become familiar with it and has developed a bond with it. However, when he bought it he had to learn how to use the camera showing the *dynamic* nature of experience.

As a *user* he has specific values, personality traits, and needs that impact on his relationship with this product. When he interacts with the camera and takes shots he finds the 'click' sound very pleasing. He also enjoys pressing the shoot button

as it feels smooth. This smoothness gives him the impression that it is a good quality product. Another product attribute that still catch his attention is the way in which he can *interact* with it. He can rotate and tilt the screen to take pictures from different angles. He also likes the overall appearance of the product, its combination of colours, shapes, and textures. He believes that the camera's personality is professional enough for him. As far as he is concerned the camera takes good quality pictures and it fulfils its instrumental functions very well. He generally uses it to have fun and record good memories which are aspect of his social *context*. The camera works well almost everywhere, except under water and extreme weather conditions. Using the camera is easy because he can connect it quickly and simply with other products, e.g. a laptop. Unfortunately, this camera does not have the smile shooter technology, which could be very useful for taking pictures with his friends, and therefore, enhancing the social experience.

1.3 *Discussion*

This chapter has reviewed in detail literature in the field of user experience. The discussion is divided in two parts. The first part presents the difference between the framework proposed in this chapter and previous work. The second part addresses the issue of the different conceptions of user experience by scholars and its implications.

The framework introduced in *section 1.2* models user experience by focusing on its key aggregates and constituent elements. It differs from previous frameworks because it aims to provide a general and integrated view rather than focusing on specific issues. By considering how previous perspectives coexist, and comparing and synthesising them we have taken a step further. The framework does not aim to replace previous models, rather to strength the fundamental aspects that those have indicated. From the review it emerged that the constituent elements have been studied to a different level. For example, the understanding of artefact attributes, i.e. aesthetic, instrumental, and symbolic, is well established, whereas the role of the context is still ambiguous. In relation to the aggregates, during recent years a more thorough understanding of emotions in product design has been gained.

However, there is still little knowledge about the dynamic aggregate of experience. In our view, the framework can become a platform for discussion of the aggregates and constituent elements by scholars. In addition, it can be a resource to identify aspects that are still unclear in user experience, or to identify literature that has focused on specific issues, e.g. social context.

The framework can also be useful to support the communication of important issues about user experience to and between designers. More so, it can be a resource to identify opportunities to design for experience. For example, assume that a designer may want to design a product or service that promotes relatedness, a relevant need identified by Hassenzahl and colleagues (2010). The assignment in itself is very broad. However, by using the framework the designer can identify the elements and sub-elements with more potential to impact on relatedness. For example, the social context may emerge as a key aspect to fulfil relatedness. The designer may also decide to investigate further social interaction by, for example, studying existing products that users think to fulfil relatedness. It is expected that the understanding gained through the framework will help designers develop product or services that fulfil relatedness.

A key issue in the field of user experience concerns how it is investigated and interpreted. This research has focused on the similarities between the views of leading authors in the field and has shown that there is substantial agreement. On the other hand there are also differences. Desmet and Hekkert (2007) have argued that experiences are restricted to the here and now. In their view, once the interaction comes to an end, the experience also stops. On the other hand, McCarthy and Wright (2004) have mentioned that our experience with an artefact is not confined to what we do and what we undergo for a specific period of time. It also includes subsequent activities such as talking about it with friends. In addition, Law et al (2008) have brought research attention towards the life span of experience. They argue that it is important to understand it in terms of the expectations that an artefact evokes, the different emotions elicited during the interaction and its development in the overall 'user experience score' of a system or artefact. A similar proposal was made by Roto et al (2011), who acknowledge that people can have indirect experience before their first encounter with a product through expectations formed from existing experience of related technologies. Indirect experience extends after usage, for example, through

reflection on previous usage, or through changes in people's evaluation of use. In this research, we have considered this issue through the dynamic aggregate and its dependent aspects termed 'experiencing' and 'accumulative experience'. Dealing with this issue is relevant to define the most appropriated method for measuring user experience and to design for experiences.

With respect to the measurement of user experience, Schifferstein (2010) has identified that current methods tend to focus on characteristic such as sensory perception, aesthetics, or emotions. This measurement is problematic because it does not reflect the real scenario. Schifferstein has also suggested alternatives to deal with the complexity of measuring user experience such as building bridges between different academic fields to develop measures of different aspects of experience, without having too much unnecessary overlap (e.g. perception, aesthetics, linguistics, semantics, emotion, anthropology). It must also be considered that experience evolves and as a result its measurement is restrained to the moment at which it is measured. Overall it seems that current methods focus on measuring 'experiencing', but it is also important to measure accumulative experiences (see Karapanos et al, 2009).

With respect to design for experiences, the dynamic aggregate represents a challenge. We have mentioned that 'accumulative experience' is the sum of 'experiencing episodes'. Once a product is defined, produced, and launched in the market, it is complicated to modify it. As a result the experience is difficult to amend. On the other hand, it is not clear how a long-term relationship can be defined from a design perspective, i.e. how 'accumulative experience' can be designed for. Mugge (2007) has studied product attachment, which is defined as the strength of the emotional bond a consumer experiences with a specific product (Schifferstein and Zwartkruis-Pelgrim, 2008). Her focus was on ordinary consumer durables with the aim to identify what affects the strength of the emotional bond with products, how this bond develops over time, and the relationship between product attachment and product lifetime. Some of her conclusions were that product attachment is not a direct outcome of the human-product interactions but the result of a process that develops over time. She has also suggested strategies to stimulate product attachment. However, her view is that designers should be aware that despite of all their efforts, it is eventually the individual consumer who gives a product its meaning; and that it is questionable

whether by conveying a special meaning to the owner is sufficient to stimulate long-term product attachment. The research of Mugge is relevant for user experience because it explores the development of the human-product interaction over time. At present there is little knowledge of how designers can influence the accumulative experience. Based on existing design strategies, it seems that designers' skills may be good enough for dealing with and defining the qualities of 'experiencing' a product but not for dealing with its dynamic nature. A deeper understanding of whether designers can influence on accumulative experiences is needed.

Limitations and further work

The framework may be seen as an oversimplification of user experience, which in reality is a much richer and complex process. However, any attempt to model a phenomenon of study is by itself a simplification (Hassenzahl, 2010). The aggregates of user experience were identified based on an analysis investigating similarities and differences between concepts proposed by scholars. For example, consciousness and awareness point to a similar idea: being aware of and responsive to one's surroundings. A detail view of these concepts, however, may bring specific differences among them. Those potential differences were not considered in this review. It is also relevant to clarify that this research does not claim that all the aggregates of user experience were identified. Other aggregates may emerge in future research that can complement those reported in this review. Furthermore, each of the four elements of the framework is complex in itself, and further work is needed to understand specific relationships between the elements and sub-elements. Another limitation of this work is that although there is a growing interest in user experience around the world, the models reviewed in this article are views from European and North American countries. It is, therefore, relevant that future work considers the frameworks proposed in other countries. For instance, the most well-known approach in Asia is Kansei Engineering, a product development methodology that aims at the implementation of the customer's feelings, impressions, and emotions into product function and design (Nagamachi, 2002). This is a general aim that user experience also has. However its similarities or differences to the literature on user experience should be investigated further. Finally, there is a need to investigate further the different philosophical stands of the literature on user experience reviewed.

1.4 *Conclusions*

This chapter has presented research to analyse, compare, and synthesise previous perspectives on user experience, which resulted in the general framework of user experience presented in *Figure 1.9*. The framework is the main contribution of this work to the field of user experience. This research follows the tradition of modelling a complex issue into a framework to support theoretical accounts for further analysis and interpretation. Frameworks tend to emphasise certain aspects at the expense of others. The framework proposed in this research places interaction at the heart of the model because it guides and affects user experience but it does not aim to give it more importance than the other elements. In our view, the framework offers a general foundation in the field of user experience, which scholars can build on. It can also be seen as an instrument to guide other scholars towards specific issues of user experience presented in previous models.

User experience is determined by many factors, which interact with one another in a complex way. This research focused on categorising and representing aggregates and constituent elements of user experience. The results presented in this chapter indicate that it is possible to distinguish patterns between the perspectives proposed by different scholars. For instance, the majority of researchers agree on user experience being subjective, conscious, emotional, interconnected and dynamic. Our analysis also indicates that an understanding of user experience requires an approach that explains how the characteristics of the user, the interaction, the artefact and the context are interrelated. These patterns are relevant for researchers and professional designers, not only to identify gaps within the current literature, but also to reflect on user experience, and to communicate its key aspects to broader audiences.

The framework supports a general explanation of user experience. Designing for experiences is an end, and therefore is fulfilled by the overall solution rather than by specific issues like product appearance or usability. Thinking in terms of issues may cause to create fragmented experiences. Instead design for experiences requires to consider the fluency and unity of the whole experience in human-product interactions. User experience represents an opportunity to understand the positive aspects of human-product interactions. Such positive influence depends on the development of adequate understanding of the user's needs, desires and wishes along with the characteristics of the context, the artefact, and the interaction.

Chapter 02

How Users Experience Great Products

***

Products have a significant role in human daily life. Users buy, collect, and surround themselves with many different objects. Sometimes, they use them to achieve concrete goals and others to express aspects of the self (Belk, 1988). The field that attempts to understand how users make sense of products is called user experience. Hassenzahl (2010) argues that the experience-oriented approach can be useful to understand what makes an experience positive, pleasurable, and good, as well as, to try to deliver pleasant experiences through product design (Hassenzahl and Tractinsky, 2006). For example, Blythe and Hassenzahl, (2003 p. 95) explain that pleasant experiences are related to objects and activities that are absorbing and personally meaningful. They contribute to the self-definition of users. More so, they are long-lived, i.e. users tend to stick to objects and activities that allow to enhance themselves. The focus on pleasant experiences has also theoretical support from other fields of research such as psychology. For example, Hektner and colleagues (2007) explain that the various theories that have flourished throughout the history of psychology suggest that individuals look for pleasure and avoid pain. It can be expected then, that users look for pleasant experiences with products. In addition, the focus on pleasant experiences implies a tendency towards users' well-being. In this line, scholars have suggested that a strong reason for understanding users' experiences with products is to improve their lives (Forlizzi, J. and Battarbee, 2004; McCarthy and Wright, 2004; and Law et al, 2008). Interestingly, there are two main perspectives on well-being, namely hedonism and eudaimonic (Ryan and Deci, 2001). The first perspective relates well-being to pleasure. The second perspective consists of more than just pleasure or happiness, as it suggests that well-being lies in the actualisation of human potentials (Ryan and Deci, 2001). It is possible that pleasant experiences are linked to these two well-being perspectives.

Scholars have also suggested that users are more interested in the overall experience that products provide than in the specific functions that they perform (Chapman, 2005). For example, during product interaction users may feel intense sensations of freedom, relatedness, popularity, and status. Users then 'evaluate' products as a whole, including their feel, look, utility, and usefulness. Another factor to consider is that once users have acquired a product they often spend significant time with it. Users' daily interactions with products can make them appreciate product qualities, which designers are not even aware of (Heylighen, and Bianchin, 2013). Based on daily interactions, users sometimes end up developing bonds with products (Mugge et al, 2009), and in some situations they modify products to meet their personal taste or needs (Slater, 2003). Recently, the non-designerly input has been captured in the term design-as-practice, which acknowledges the work done by professional designers but also opens up design to others, such as managers, or end-users who through their practices, also take part in design (Kimbell, 2012). Similarly, a set of perspectives, such as user centred design, co-design, inclusive design, and user experience have emerged trying to influence the professional practice of design by acknowledging the central role of the user in human-product interactions. Despite this central role, to date little is known about how users experience products in daily-life. Therefore, the objective of this research is to investigate pleasant experiences that people gain from durable products in daily life.

2.1 *User experience*

Research in user experience attempts to understand how users make sense of products in a particular context and time. A detailed comparison and synthesis of different views and perspectives on this subject can be found in (Ortíz Nicolás and Aurisicchio, 2011). According to this work, the majority of researchers agree on user experience being subjective, conscious, emotional, interconnected, and dynamic. The review also indicated that user experience is determined by at least four elements: the user, the interaction, the artefact, and the context. User experience is not a property of the product but the outcome of human-product interaction and

therefore it is dependent on the user (Desmet and Hekkert, 2007). *Users* bring their knowledge, senses, values, emotions, and needs to the experience. The *interaction* is the basic relationship that binds the user and the artefact. At a deeper level various types of activities are involved in human-product interaction. The *artefact* is made by a human being to perform technical and non-technical functions, e.g. symbolic and aesthetical. And the *context* is understood as a complex, dynamic set of factors (Forlizzi, 2007). It includes at least the following sub-elements: physical, social, situational, cultural, and temporal.

Two specific issues that will be addressed in this research to gain a deeper understanding of pleasant experiences with durable products are the needs and emotions that they fulfil and evoke. Previous research has shown a strong relationship between needs, emotions, and positive affect. For example, Hassenzahl et al (2010) have shown that the fulfilment of universal needs is a source of pleasant experiences with interactive products and technologies. They have also suggested that these experiences can be categorised on the basis of the needs that they fulfil, e.g. experiences related to competence, belongingness, etc. Emotions are important because they regulate the tone of the experience (Varela et al, 1991) and colour it (McCarthy and Wright, 2004). These antecedents explain why it is important to study needs and emotions in relation to pleasant experiences.

2.2 *Understanding the experience of great products*

This section reports the process to carry out this study including the research approach, the participants, the material and the procedure.

2.2.1 *Research Approach*

Given that this investigation deals with the subjective interpretation of pleasant experiences that people gain from durable products, the emotions elicited and the needs fulfilled, phenomenology was found to be a suitable mode of inquiry (Creswell, 2007). Phenomenology relies on the subjective interpretation of the world

by a person, the way in which that person sees the world and himself or herself in it, including perceptions, thoughts, feelings, and emotions (Apter, 2006 p.3). To develop new understanding of users' experiences with durable products this study used semi-structured interviews as a research method, which has been used in previous user experience research (Arhippainen, and Tähti 2003; Forlizzi, 2007). Differently to previous studies of pleasant experiences this work is based on qualitative rather than quantitative research (e.g. Hassenzahl et al, 2010). In addition, it investigates user experience from a broad perspective to offer a more realistic scenario as suggested by Schifferstein (2010). The broad perspective is based on the four constituent elements of user experience, i.e. the user, interaction, context and artefact (Ortíz Nicolás and Aurisicchio, 2010).

2.2.2 *Selecting a stimulus that enhances a pleasant experience*

In this research it was decided to study pleasant experiences using products familiar to the subjects interviewed. The reason is that we were interested in consolidated pleasant experiences. In addition, the participants were made responsible to select and bring to the interview a product in their possession. Considering that pleasant experiences can be triggered by products ranging from satisfactory to excellent we decided to focus on excellent products as these are likely to trigger positive experiences more intensive and easier to remember than other product types, e.g. satisfactory or good. In the communication with the participants to this research we decided to refer to these products as 'great' products because this is a term more frequently used by people. Great can be considered as a synonymous of excellent and it can be used to express qualities or eminences of a product considerably above average ones (Oxford Dictionary, 2014). The participants to this research were asked to select a 'great' product, based on their personal understanding of this term. By following this approach we aimed at understanding and characterising pleasant experiences in an indirect way.

2.2.3 *Participants*

Eighteen respondents participated to this study (ten males and eight females). This number of respondents was considered a good trade-off between gaining rich data about experiences with great products and sampling different views. The respondents were from various nationalities, including French, Belgian, Austrian, Indian, Swedish, Italian, Lebanese, Mexican, Singaporean and British. Participants had no relation to the activity of product design, and had a background either in engineering (mechanical, biomechanical, computing, electric, tribology, and control) or in mathematics. All participants were students enrolled at Imperial College London, and ten were undergraduate and eight postgraduate students. They were between 19 and 37 years old (M=23.44; SD=4.8). They all had a good command of English, and two were native speakers.

2.2.4 *Material*

The sections below report the materials employed to capture the needs fulfilled and the emotions evoked by great products.

Needs

Ten universal needs, as identified by Sheldon and colleagues (2001) and previously used in research on user experience (Hassenzahl et al, 2010), were printed on cards with their descriptions and used in the interviews (white paper sheets of 18 cm by 4 cm), see *Table 2.1*.

No.	Need	Description
1	Autonomy - Independence	Feeling like you are the cause of your own actions rather than feeling that external forces or pressure are the cause of your action.
2	Competence - Effectance	Feeling that you are very capable and effective in your actions rather than feeling incompetent or ineffective
3	Influence - Popularity	Feeling that you are liked and respected, and have influence over others rather than feeling like a person whose advise or opinion nobody is interested in
4	Money - Luxury	Feeling that you have plenty of money to buy most of what you want rather than feeling like a poor person who has no nice possessions
5	Physical thriving - Bodily	Feeling that your body is healthy and well-taken care of rather than feeling out of shape and unhealthy
6	Pleasure - Stimulation	Feeling that you get plenty of enjoyment and pleasure rather than feeling bored and understimulated by life.
7	Relatedness - Belongingness	Feeling that you have regular intimate contact with people who care about you rather than feeling lonely or uncared of
8	Security - Control	Feeling safe and in control of your life rather than feeling uncertain and threatened by your circumstances
9	Self-actualising - Meaning	Feeling that you are developing your best potentials and making life meaningful rather than feeling stagnant and that life does not have much meaning
10	Self-esteem - Self-respect	Feeling that you are a worthy person who is a good as anyone else rather than feeling like a "loser"

Table 2.1. *Ten universal needs*

Emotions

Twenty-two emotions were selected and printed on cards (white paper sheets of 9.5 cm by 5 cm) that were used in the interviews, see *Table 2.2*. These emotions are positive and negative and were selected from four previous studies (Desmet 2002; Ortíz Nicolás and Hernández López, 2008; Laurans and Desmet 2012; Desmet 2012). Positive and negative emotions were included to identify if experiences with great products are pleasant. If they are, participants should report that the selected product elicits mostly positive emotions in them. *Table 2.2* shows the list of emotions and the study in which each of them was previously investigated. For example, anticipation was selected from Desmet (2012), whereas joy was used in all of four reviewed studies.

	Emotion names	Desmet (2002)	Ortiz Nicolas & Hernandez Lopez (2008)	Laurans and Desmet (2012)	Desmet (2012)
Positive	Admiration	✓	✓	✓	✓
	Amusement	✓	✓		✓
	Anticipation				✓
	Confidence		✓		✓
	Fascination	✓	✓	✓	✓
	Inspiration	✓	✓		✓
	Joy	✓	✓	✓	✓
	Pride			✓	✓
	Relaxed				✓
	Satisfaction	✓	✓	✓	✓
	Surprise	✓	✓		✓
Negative	Boredom	✓	✓	✓	
	Contempt	✓			
	Disgust	✓		✓	
	Displeasure		✓		
	Disappointment	✓	✓		
	Dissatisfaction	✓	✓	✓	
	Fear			✓	
	Frustration	✓	✓		
	Hostility	✓	✓		
	Sadness			✓	
	Shame			✓	

Table 2.2. *Twenty-two emotions selected per study*

2.2.4 *Interview procedure*

The procedure was carried out individually in a quiet room. Prior to the interview, participants were asked to select a 'great' product and carry it along to the interview. They were encouraged to think of a 'great' product in whatever way made sense to them, and were explained that the researchers wanted to discover their own meaning of the term. The session was divided into four phases. First, the participants were asked to describe their experience based on the characteristics of the user, the interaction, the product, and the context. The questions asked during the interview can be found in *Appendix 1*. Second, with the support of the ten cards showing the needs in *Table 2.1*, the participants were asked to choose those that they fulfilled with the selected product. They were also asked to explain how the chosen needs were fulfilled. Third, with the support of the twenty-two cards displaying the emotions in *Table 2.2*, the participants were asked to choose and explain the emotions that the product triggered in them. Participants were allowed to choose as many needs and emotions as they wanted. Finally, the session ended by asking participants who or what influenced their evaluation of a great product. The interviews were completed in about 30 minutes and were audio recorded.

2.3 *Results*

Following the data collection the interviews were transcribed, and the data were organised. Preliminary data analysis focused on the reasons that participants reported to explain why their products were considered great. This led to the identification of two groups of experience named: 'pragmatic' and 'significant'. Based on this, the data was split per experience and further analysis was carried out. *Figure 2.1* shows a basic comparison of the two experiences.

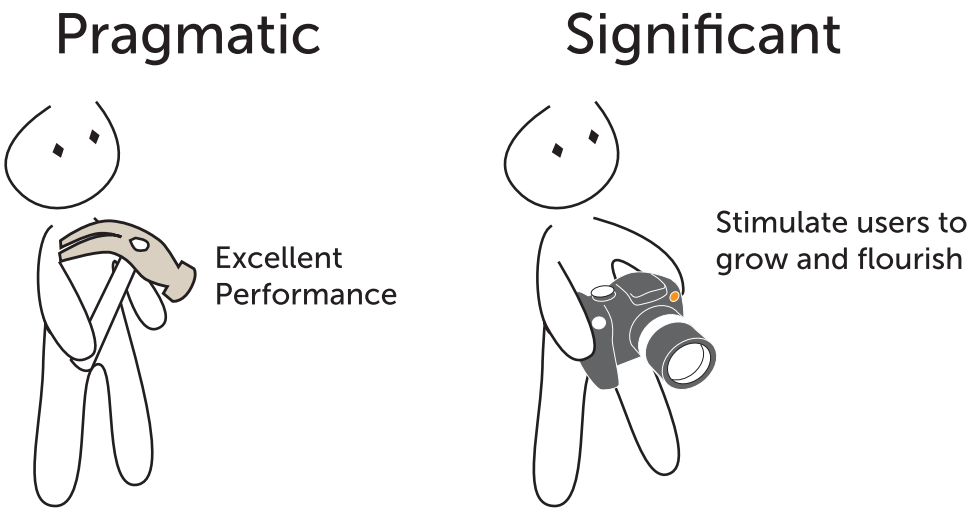


Figure 2.1. *Two types of experiences with great products*

2.3.1 *Experiences with great products*

This section presents first the two identified experiences and then the needs fulfilled and emotions triggered by those experiences.

Pragmatic Experience

The pragmatic experience is described in *Table 2.3* by means of the products brought by participants and the justifications of why they are great. Eight instances of experience were included in this group, and the products involved were: a sport watch, a mobile phone, an external hard drive, a backpack, an Mp3 player, a fountain pen, a Bic biro, and a bicycle, see *Figure 2.2*



Figure 2.2. *Eight great products that enhance a pragmatic experience*

The term 'pragmatic' as used to characterise this experience refers to a utilitarian view of human-product interaction.

Product	Why is this a great product?
Sports watch	*It is the classic watch, the Casio, it is really basic. There is nothing fancy about it. You just know when you buy it that it will do what you want it to do.*
External hard drive	*The characteristics of this product to make it great are: it is small, it has high storage, it looks pretty, and it came with everything I needed to use it, so I do not need additional things.*
Bic biro	*It is 'something which fulfils the expectations of the user and serves a purpose and it does that in a way which does not cause the user to feel impedance when they select the product. This one is phenomenally cheap, does exactly what you would expect it to do, it works every time, and it just does what it is supposed to do and it serves its purpose well.'*

Table 2.3. *Pragmatic experiences*

Participants whose experiences were classed as pragmatic explained that the greatness of their products is linked to how well the products perform the instrumental function, i.e. what the product is meant to do. They also reported that the products were easy to use and that they did not need special skills to use them. Other product attributes such as appearance or novelty were seen as extras but not the core of the experience. Six participants from this group reported that the evaluation of a great product is strongly influenced by the characteristics of the user and the product. The remaining two participants reported that it depends either on the user, or on the product. Participants described their experiences using the following words: comfortable, positive, reliable, fine, professional, satisfying, and good.

The large majority of the participants (7/1) indicated that they were not attached to the product that they chose; some explained that this was positive because it meant that they could replace them at their will. In addition, five participants reported that they did not intend to reflect aspects of their identity through the products. The remaining three mentioned that the products portrayed aspects of their identity such as pragmatism, preference for function over form, or for good quality.

Regarding interaction the following results emerged: participants found difficult to express product-interaction qualities. Nevertheless, they used descriptors for the interaction such as: comfortable, smooth, well-built, and with familiar or standardised interactions. Regarding the activities that they typically do with their products all participants reported that these were important in their daily life, e.g. doing exercise.

With respect to the context all participants reported that their products adapt well to different environments, i.e. physical context. Social context was not relevant for the participants. Two mentioned it but as a negative aspect of their products because they did not fit well in social interactions, e.g. the Bic biro will not be used in a business meeting or the sport watch in a party. About situational context six participants reported that they used their products for both work and leisure, e.g. a mobile phone for playing but also for arranging meetings. The other two participants reported that they used their products only for work.

Significant Experience

The significant experience is described in *Table 2.4* by means of the products brought by the participants and the justifications of why the products are great. Ten instances of experience were included in this group, and the products involved were: two hair straighteners, a mixing turntable, an amplifier, an instant camera, an electric piano, a watch, a guitar, an electronic tablet, and a pair of trousers, see *Figure 2.3*.



Figure 2.3. *Ten great products that enhance a significant experience*

The term 'significant', as used to characterise this experience, refers to a constructive view of human experience involving five key aspects (namely active agency, order, self, social-symbolic relatedness, and lifespan[1]) and was taken from constructive psychology (Mahoney, 2004). This view emphasizes the importance of meaningful actions by a developing self in complex and unfolding relationships (Mahoney, 2004).

Thus, the significant experience stresses the valuable role of the activities involved in human-product interaction. These offer benefits for users including possibilities for growth and acknowledge the active role that users have in human-product interaction. In addition, these experiences are significant because users reaffirm themselves through the activities undertaken and the products involved.

Product	Why is this a great product?
Instant camera	*Something that is suitable for you and that you use very often and do not get bored of. It also needs to be something you are comfortable with.*
Electric piano	*In this case, what characterises a great product is the fact that you enjoy using it and you do not spend your time worrying about it: is it going to break? Am I doing something wrong?*
Hair straightener	*It is not what is cool at the moment, what everyone has, but it is something great for someone in particular. Like the first thought that crosses your mind is like would I be able to live without that? I think that is a definition of a great product. This product is like a part of me, I take it everywhere I go.*

Table 2.4. *Significant experiences*

Participants whose experiences were classed as significant explained that the greatness of the products is related to how suitable the products are for them, i.e. how well they adapt to the users. They explained that with the help of their products they can express themselves, for example, by creating new music or pictures, and do enjoyable activities. They also reported that in order to use the products they refined or developed some skills, e.g. playing the piano, or mixing music. This indicates that users have an active role in human-product interaction, and that participants to this research seem to be aware of it. More so, participants reported that once they learnt how to use these products, they found them easy to use. All participants reported also that their products worked well, and that this was a basic attribute of them.

[1] The five aspects identified by Mahoney are illustrated next. First, human experiencing involves continuous *active agency*. Second, *order* reflects the contention that much human activity is devoted to meaning-making processes. Third, the organization of personal activity is fundamentally *self*-referent. Fourth, individuals cannot be understood apart from their organic embeddedness in social and *symbolic* systems. Finally, all of this active, meaningful, and socially-embedded self-organization reflects an ongoing developmental flow of the experience, i.e. *lifespan*.

Nevertheless, they acknowledged that this attribute was not enough to assess them as great. Eight participants from this group indicated that the evaluation of a great product is strongly influenced by the characteristics of the user and the product. The remaining two participants reported that it depends either on the user, or on the product. When participants were asked to describe their experiences they used the following descriptors: fun, comfortable, very positive, enjoyable, and intimate.

Six participants from this group reported that they were attached to the products because they were either mementos of happy times, e.g. a gift, or of enjoyable activities, e.g. playing music with an instrument. In addition, the large majority of the participants (9/1) reported that the products reflected something about themselves, e.g. their personal interests and creativity.

Participants from this group also found difficult to verbalise qualities of the interaction. Nevertheless, they used descriptors for the interaction such as: 'old fashioned', nice, and comfortable. Regarding the activities that participants typically do with the products, they all reported that these were important in their daily life.

With respect to context, all participants from this group reported that the products adapt well to different environments. Eight participants mentioned social context as a positive aspect of the experience. For example, playing music, or looking nice is relevant in a social context. About situational context six participants reported that they used the products only for leisure. The remaining four used it for both leisure and work.

2.3.2 *Needs involved in experiencing great products*

The needs fulfilled by the products are shown and compared in *Figure 2.4* per experience type (pragmatic=8, significant=10). It is relevant to mention that three participants reported that some needs were too abstract and because of this, it was challenging for them to link them to products.

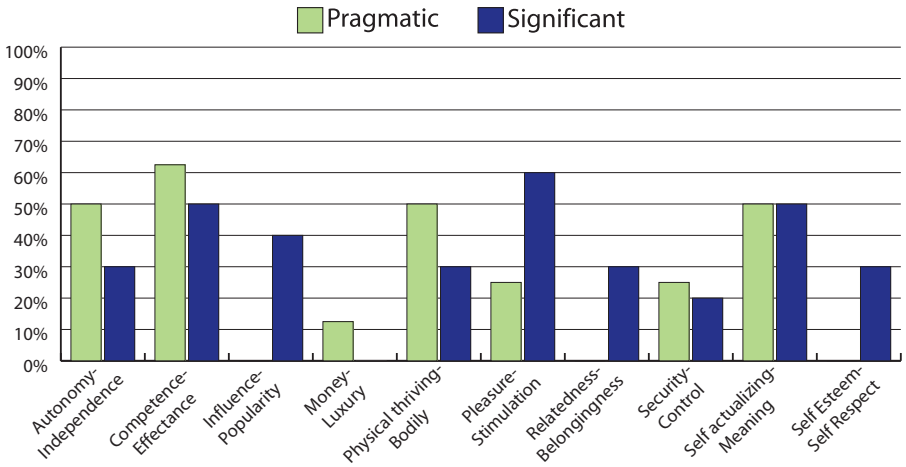


Figure 2.4. *Needs fulfilled by great products*

The most salient needs (i.e. those reported by at least 50% of the participants) fulfilled by products evoking the pragmatic experience were autonomy-independence, competence-effectance, physical thriving-bodily, and self actualising-meaning. It is noteworthy that all the previous needs seem to be goal oriented, e.g. feeling meaningful and being autonomous, competent, and healthy. Pleasure-stimulation was, instead, the most salient need fulfilled by products evoking the significant experience. The need fulfilled by this experience indicates a substantial difference from pragmatic experiences. Other two relevant needs for this group were competence-effectance and self actualising-meaning. It is interesting to note that influence-popularity, relatedness-belongingness, and self esteem-self respect were fulfilled only by products that enhance significant experiences. If we consider that influence-popularity points to products and activities as means to be sociable, and relatedness-belongingness to products as means to be in touch with friends and family, we can consider the important role of personal relationships in significant experiences and further understand their differences from pragmatic experiences. Money-luxury and security-control seem to be little relevant for great products. This result indicates that people gave limited importance to monetary and security issues. On average participants from the significant group reported more fulfilled needs (M= 3.40 SD= 1.85) than the participants from the pragmatic group (M= 2.75, SD = 1.49).

How the needs were fulfilled

The participants to this study fulfilled their needs through either the product itself,

e.g. a mobile phone, or the activity carried out with the product, e.g. cycling, or the outputs of the activity, e.g. good music. These three sources of fulfilment are used in *Table 2.5* to explain the most salient needs. To identify the sources of fulfilment we relied on those suggested by Desmet, (2012). Although he identified them for emotions evoked by products, the sources were found to be useful also to explain how the needs are fulfilled in human product interaction. The numbers in brackets in *Table 2.5* indicate the percentage of the group that chose that need. From *Table 2.5* it can be seen that competence-effectance and physical-thriving-bodily were fulfilled by the activity that is performed with a product. Self-actualising-meaning and pleasure-stimulation were, instead, fulfilled by both the involved activity and the product. Finally, autonomy-independence was fulfilled by the product, which indicates how products can be a mean for a person to be independent.

Need		Explanation
Competence-effectance	P	(62.5%) It was fulfilled through the *activity*, e.g. doing exercise. By performing it the person felt very capable and effective due their progress, i.e. running faster.
	S	(50%) It was fulfilled through the *output of the activity*. A person felt competent when they had taken a good picture or had played good music.
Autonomy-independence	P	(50%) It was fulfilled through the *product*. By using it, the person was independent, he/she relied on their performance to do something, e.g. travelling with a bike.
	S	Not relevant for this group
Physical thriving-bodily	P	(50%) It was fulfilled through the *activity*, e.g. doing exercise had a positive impact on users' health. Products were user's companions when doing these activities.
	S	Not relevant for this group
Self-actualisation-meaning	P	(50%). It was fulfilled through the *activity*, e.g. studying. These activities were meaningful for the person because through them, they developed their best potentials.
	S	(50%) It was fulfilled through the *product*, e.g. mixing good music with a turntable represents an everyday challenge and through daily use users develop their best potentials. It was also fulfilled through the *activity's output*, e.g. creating good music.
Pleasure-stimulation	P	Not relevant for this group
	S	(60%) It was fulfilled through the *activity*, e.g. listening to music, taking pictures, playing music, or watching films are pleasant in themselves. *Products* also fulfilled this need because of the way users interact with them, e.g. a turntable.

Table 2.5. *Salient needs fulfilled per group* (P=Pragmatic; S=Significant)

2.3.3 *Emotions involved in experiencing great products*

The emotions elicited by the products are shown and compared in *Figure 2.5* per experience type (pragmatic=8, significant=10). The most salient emotions (i.e. those reported by at least 50% of the participants) from the pragmatic group were: satisfaction, relaxed, and amusement. For the significant experience the emotions were instead: joy, satisfaction, relaxed, confidence, amusement, inspiration, and pride. On average participants from the significant group reported more emotions elicited by their products (M=6.6 SD=3.6) than the participants from the pragmatic experience group (M= 4.25 SD=2.49). It is interesting to note that great products from both the pragmatic and significant groups elicited very few negative emotions. For the pragmatic experience the emotions triggered by the products were: boredom, disappointment, frustration, and shame. For the significant experience the emotions triggered, instead, were: frustration, dissatisfaction, boredom, disappointment, dissatisfaction, and hostility. For frustration and dissatisfaction users reported that they experienced them due their bad performance (self-responsibility), i.e. taking bad pictures or playing bad music.

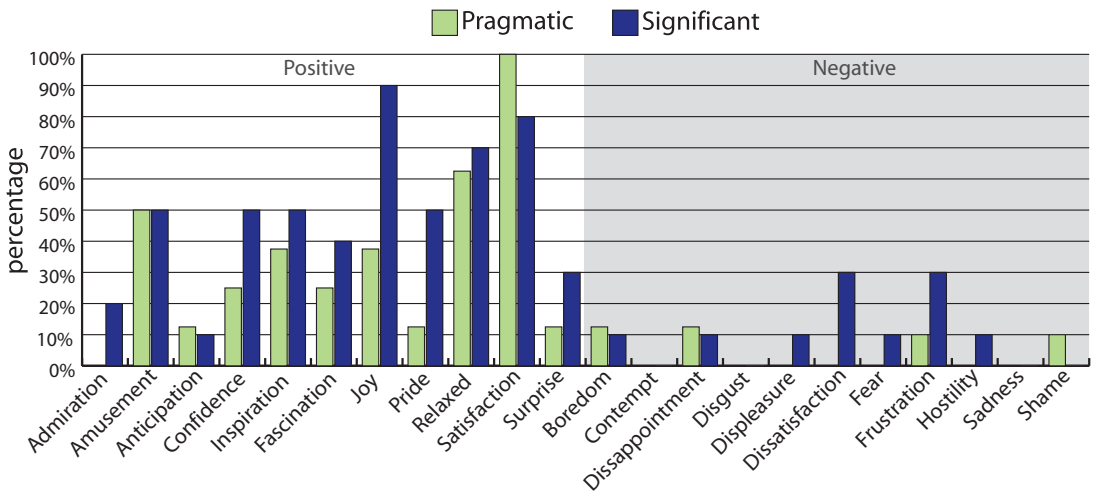


Figure 2.5. *Emotions evoked by great products*

How the emotions were evoked

The participants to this study had their emotions evoked by either the product itself, the activity that is facilitated, the self, and other people. These sources have been previously identified by Desmet, (2012). Four of the identified sources are used in *Table 2.6* to explain the most salient emotions.

Emotion		Description
Satisfaction	P	(100%) It was triggered mostly by the good performance of *the product*. In few cases by *the person's performance* e.g. doing exercise is good for their health and satisfying.
	S	(80%) It was triggered by the *activity's output*. Thus, it is related to *users' achievements*. They were satisfied by the music they created, or the picture they took.
Relaxed	P	(62.5%) It was triggered by *the product's* good performance; when it works well users do not have to worry about it. It was also triggered by the involved *activities*, e.g. cycling
	S	(70%) It was triggered by the involved *activities* e.g. playing music is relaxing, and comfortable. Participants were absorbed into it and experienced relaxation.
Amusement	P	(50%) It was triggered by *the activities* that participants typically perform with their products, e.g. playing video games or watching films.
	S	(50%) It was triggered by *the activity*, e.g. playing the guitar and the piano were reported as amusing. *Products* were also means to be amused, e.g. watching films on a tablet.
Joy	P	Not relevant for this group
	S	(90%) It was triggered by the attributes of *the product*, e.g. a turntable. It was also elicited by *the activity*, e.g. playing music is joyful in itself; and by *the activity's output*, e.g. tacking good pictures triggers joy in the person.
Confidence	P	Not relevant for this group
	S	(60%) It was elicited by *the self*, e.g. the person was confident because they were capable to deal with a challenging situation. It was also related to self-expression, e.g. looking good. In less degree users were confident because of *the product's* good performance.
Inspiration	P	Not relevant for this group
	S	(50%) It was triggered by *the activity*, playing music is engaging and allows the person to create and explore new sounds. It was also triggered by *the product*, when the person could do new things with it; and by *other people's* ideas which can be accessed with the help of some of the chosen products, e.g. through an electronic tablet
Pride	P	Not relevant for this group
	S	(50%) Pride was elicited by *the self*. Participants reported to be proud to own these products or to take pride in what they do.

Table 2.6. *Most frequent evoked per group* (P=Pragmatic; S=Significant)

2.4 *Discussion*

The results of this research explain how users experience great products, including the needs fulfilled and the emotions evoked. Two experiences, namely pragmatic and significant, were identified based on the descriptions provided by users and confirmed by the investigation of needs and emotions. These experiences differ in the way in which users deal with products and in the level of pleasure that they gain from them. In addition, four constituent elements of user experience identified in previous research, namely the user, the product, the interaction and the context, were investigated to better understand user experience with great products. The results also indicate that the descriptions provided by participants are of products actually above average. This indicates that participants understood well the instruction to bring along 'great' products.

In this research there are three main results showing that great products enhance pleasant experiences. First, the descriptions provided by users indicate that experiences with great products are reliable, positive, and fun. Second, some of the needs fulfilled by great products, e.g. pleasure, relatedness, competence, and popularity, are linked to pleasant experiences as it was also found in previous research (Hassenzahl et al, 2010). However, for the pragmatic experience, only competence emerged as a need associated with pleasant experiences. Third, the emotions evoked by great products are mostly positive. The pleasantness of great products varies depending on the experience type. Users whose experiences were classified as significant seem to derive richer pleasure from their products in comparison to users whose experiences were classified as pragmatic. In order to clarify the differences in richness of pleasure between the experiences we rely upon four findings. First, users in the significant experience group reported more often that their products fulfilled the need of pleasure-stimulation. Second, products from the significant experience group evoked a richer quantity and variety of emotions (e.g. joy, satisfaction, confidence, relaxed, amusement, inspiration, and pride), in comparison to products from the pragmatic experience group (e.g. satisfaction, relaxed, and amusement). Third, when taking into consideration the activities that users typically perform with products that enhance significant experiences, it seems that their nature is more

pleasant than those linked to pragmatic experiences, e.g. cycling versus backing up data. Fourth, the characteristics of the interaction and the product are reflected in the richness of the experience, e.g. the turntable versus the external hard disk. The activities performed with the product, the attributes of the product, the needs fulfilled, and the emotions elicited indicate that significant experiences are more pleasant than pragmatic experiences.

Users whose experiences were found to be pragmatic seem to have a utilitarian relationship with their products. They were not attached to the products or did not use them to communicate something about their identity. Nevertheless, they valued the overall product and gave a central role to performance. In relation to this, previous research as well as this study have shown that basic functionality when well executed is a source of pleasure (Burns and Evans, 2000) and that the pleasure capacity of functionality should not be underestimated (Porter et al, 2008). The pleasant side of pragmatic experiences partially covers aspects of hedonic well-being. This especially relates to the fluency that users have with their products and how these enable them to perform activities that are important for them. Users whose experiences were found to be significant seem to have a personal relationship with their products, i.e. these are suitable for them, and as a result they can create with them, be attached to them, and reflect something about themselves. Significant experiences fit better with eudaimonic well-being, because products from this group seem to help users pursue their potential. For example, great products from the significant experience group provide users a stimulating challenge and help them pursue something of value within a community (e.g. playing music for friends) or something more meaningful for them (e.g. enjoying life). Emotions triggered by products from the significant experience group such as joy, amusement, and pride, positively correlate with those identified by psychology researchers interested in emotions and well-being and shown to improve psychological well-being, and physical health functioning (Ellsworth and Smith, 1988; Fredrickson, 2003). There is, however, a need to undertake further research to investigate and confirm the relationship between pragmatic experiences and hedonic well-being, and significant experiences and eudaimonic well-being.

Designers who aim to design for well-being need to understand the differences between these two perspectives for at least two reasons. First, to select the perspective

that aligns better with the characteristics of the project that they are undertaking. Second, to reflect on the role that users have in human-product interactions, e.g. passive or active agents. These issues are addressed in the following paragraphs.

Many designers aspire to promote well-being in users. At present it is not clear if this is possible. However, designers who attempt to fulfil this aspiration can start by identifying if the design project that they are working on can promote either hedonic or eudaimonic well-being. The selection of the most appropriate conception will guide designers during the design process. For example, eudaimonic well-being considers the active role of the person when developing their human potentials. To promote an active role by users designers may stimulate self-expression with or through products. Users can be part of the design solution by adding their personal touch (Mugge, 2007). A second way to promote an active role by users is to create solutions that make the person feel satisfied about their performance instead of focusing on improving the product's performance. Both aspects are relevant. However, the choice impacts on the type of experience that the user will gain. A third way to promote an active role by users is through autonomy and mastery, which have been previously linked to well-being by Ryff and Keyes (in Ryan and Deci, 2001). To promote mastery designers can develop solutions that represent a challenge to the user. By overcoming the challenge it is expected that users become better at something, e.g. more skilled musicians or drawers.

Designers also have to consider that products may have different chances to impact on the user's well-being. Think, for example, about a hard-disk versus a hair straightener. The first product helps the user back up their data, while the second helps the user enhance their appearance. The importance of these activities may vary depending on the situation, e.g. enhancing the appearance of a person may be more relevant on a day to day basis and especially in social contexts (Belk, 1988). This example shows that some activities may be more relevant than others to enhance pleasure. Identifying and focusing on those may help understand relevant aspects of well-being, which later can be implemented in the practice of design.

This study focused on the user, the interaction, the product and the context, for the purpose of developing deeper understanding of these aspects of user experience. User experience is the result of a person interacting with at least one product. The results of this study support the mainstream view that user experience is subjective

(e.g. Forlizzi and Battarbee, 2004; Hassenzahl, 2010) and question the view of McCarthy and Wright (2004 p.85) who argue that experience does not refer to subjective states. These authors claim that user experience is the irreducible totality of people acting, sensing, thinking, feeling, and making meaning in a setting, including their perception and sensation of their own actions. In our view this understanding of user experience refers to the interconnected aspect of user experience instead of its subjective nature.

This study showed that it is difficult for users to articulate or verbalise the attributes of the interaction. Nevertheless, a set of interaction descriptors was identified such as familiar, old fashioned, or comfortable interactions. These descriptors complement the interaction modes suggested by Forlizzi and Battarbee (2004) and can help direct future research. In addition, this study shows the relevance of activities that users performed with their products. Activities, however, are context dependent and relational (Blythe and Hassenzahl, 2003, p. 94). They depend on the situation itself and on the product used to perform the activity. The results of this study indicate that more research is needed to better understand the role of interaction and activities in user experience. Regarding the context of use and its sub-elements, significant experiences involve social interactions, which also play a role on the overall experience, as well as, the situation in which the product is used, i.e. leisure versus work. About the cultural context, most of the participants were European; therefore, the findings of this research are expected to be culture-dependant. Hofstede (1991), for example, identified that self-actualization is a goal in individualistic countries. On the other hand, collectivist societies seek different goals such as harmony and consensus. Although participants to this study were from various countries this is still an unclear issue.

In the field of user experience, Hassenzahl (2010; 2003) has suggested the terms 'pragmatic' and 'hedonic' to describe product attributes. Pragmatic attributes provide effective and efficient means to manipulate the environment, whereas hedonic attributes provide stimulation, identification and provoke memories. These terms are similar to the two experiences identified in this study, i.e. pragmatic and significant. However, in this research the terms are used to communicate the overall experiences or characters of the products not to their attributes.

In this research we decided to use 'great' products instead of other types because

we wanted to study products that stand out. At the same time we decided to use language that participants could easily relate to.

Limitations and further work

The results of this study are strongly linked to the class of products that was investigated. Hence, it would be interesting to understand if the distinction between pragmatic and significant experiences holds true for products that are not classed as great. In addition, the distinction of experiences into pragmatic and significant may be too basic to explain the variety of experiences that result from human-product interactions. In this research some users described their experiences as professional, reliable, comfortable, fun, and enjoyable. These can be types of experiences to be studied in future research.

Previous research has identified that pleasure differs between age, social and gender groups (Porter et al, 2008). It has also been suggested that pleasure may vary among nationalities and cultures (Demirbilek and Sener, 2010). Therefore, the results of this study are strongly linked to the characteristics of the participants to this study. More research is needed to confirm the findings of this study, for example, by employing larger or different populations.

2.5 *Conclusions*

This chapter has presented research to investigate the experiences that users have with great products in daily life. The contribution of this research to the field of user experience is the identification of two types of pleasant experiences, namely pragmatic and significant. In particular, user experience was studied indirectly by means of great products and taking a broad perspective.

A conclusion of this research is that a broad perspective is important to investigate and understand pleasant experiences. In particular, studying the experiences described by users together with the needs fulfilled and the emotions activated was found to be useful to deliver new understanding of pleasant experiences and to generate a rich picture of how the user, the interaction, the product and the context

determine user experience. Regarding the characterisation of pleasant experiences, emotions were found to be a more reliable indicator than needs because they are more distinctively positive. Needs were often fulfilled by the activity that a person performed with a product. Emotions were elicited by both the activities performed and the products' characteristics. Activities seem to be more important than the products as means of fulfilment of needs and elicitation of emotions.

The results of this study indicate that users can interpret, recognise and assess a product with attributes well above the others, i.e. a great product. The views of users are essential because they bring their creativity, goals, and motivations to human-product interaction. Based on the data gathered in this study, we identified two types of experiences, which we have termed pragmatic and significant. These experiences differ in the level of pleasure that they provide to users. The two experiences also differ to previous typologies because they attempt to capture the overall experience in contrast to experiences that focus only on specific issues, such as needs. Designers could use the knowledge developed as part of this research to create products that work well and are beautiful, but also to create products that embody possibilities for users, can be modified for their own benefit and have the intentional purpose of impacting on users' well-being.

Chapter 03

Differentiating Positive Emotions Elicited by Products

* * *

Emotions have been described as episodes of interrelated and synchronised changes in human beings that occur in response to the evaluation of external or internal stimuli and have some personal relevance (Scherer, 2005). They are typically event focused, adaptable, short lasting, of variable intensity, and have an impact on human behaviour. Previous research in the field of user experience has highlighted the importance of emotions indicating that they are at the heart of experience and they colour it (Hassenzahl, 2010; Forlizzi and Battarbee, 2004; McCarthy and Wright, 2004; Ortíz Nicolás and Aurisicchio, 2011). Without emotional engagement, experience would lack unity and would fail to be an experience (McCarthy and Wright, 2004). Emotions coexist with motivation and cognitive processes, and with them contribute to experience in every moment of our life (Hektner, et al, 2007). All experiences have some kind of feeling tone regulated by human emotions (Varela, et al, 1991).

In a similar line, various models have been developed to explain the role of emotions in product design (Jordan, 2000; Desmet, 2002; Hassenzahl, 2003; Norman, 2004; Rafaeli, and Vilnai-Yavetz, 2004). However, a limitation of these models is that they tend to focus on umbrella terms such as pleasure or positive emotions and they are too rudimentary to be useful to explain the variety of positive emotions experienced in human-product interactions (Desmet, 2012). Diversity is a key factor of human experience and it is not captured in the term 'pleasant experiences'. As a result of human-product interactions people do not just experience satisfaction, but also a range of other emotions such as confidence, surprise, or fascination.

Even though positive emotions are important in daily life, there is little knowledge about them. Seligman and Csikszentmihalyi (2000) have argued that despite psychology having understood a range of negative human characteristics, it still

needs to address the issue of what makes life worth living. Recent research on positive emotions has shown that they are central to human nature, contribute richly to people's quality of life, and improve psychological well-being and physical health functioning (Ortony et al, 1988; Fredrickson, 2003). Emotions also seem to be responsible to appraise the potential benefits of a situation, e.g. they help reinforce activities that make us feel good, such as socializing (Ellsworth and Smith, 1988; Sauter, 2010). In addition, many positive emotions broaden people's momentary thought-action repertoire (Fredrickson, 1998). In the field of product design, as it happens in psychology, it has been identified that positive emotions have been underexplored (Yoon et al, 2013). For example, enchantment, inspiration, and kindness have been hardly studied even though they are relevant to design practice. This lack of knowledge increases the difficulty to elicit positive emotions through products and explains why there are few reported strategies to design them. Developing new knowledge about positive emotions can be used to measure them and design positive experiences (Laurans et al, 2012).

To set the foundation to research the variety of positive emotions experienced in human-product interaction, Desmet (2012) identified twenty-five design-relevant positive emotions. He also suggested six sources that explain how these emotions are triggered by products, i.e. object, meaning, interaction, activity, self, and other. Even though this work has been an important step towards developing a better understanding of pleasant user experience, there are still many unknown differences between the emotions. For instance, it is not known which of the twenty-five emotions are frequently experienced and preferred by users in relation to human-product interactions. Similarly, it is not known which emotions designers would like to elicit through their designs.

Previous research has found that emotions play a critical role in user experience (Jordan, 2000; McCarthy and Wright, 2004; Hassenzahl, 2010). In particular, it is known that positive emotions are relevant because they indicate the valence of the experience (Varela et al, 1991). Emotions can also be a means to understand what actually triggers a pleasant experience. Acknowledging the latter this research builds upon the set of twenty-five positive emotions developed by Desmet (2012). Specifically, the objective of the research is to investigate and distinguish the set of twenty-five positive emotions in relation to four qualities of emotions such as the

'frequency of experience' and 'preference for experience' by users, and the 'preference for elicitation' and 'difficulty of elicitation' by designers. These qualities were selected due to their relevance to product development. For example, identifying the emotions preferred by users and designers in human-product interactions has the potential to develop detailed knowledge of those emotions. The results can also help develop a plan of action to define which emotions may need more attention in comparison to the others. It is noteworthy that a key aspect of this study is also the identification of the reasons underlying any difference between emotions.

3.1 *Understand positive emotions in product design*

This section presents the process followed to carry out this study, including the research approach, the participants, the material, and the procedure.

3.1.1 *Research approach*

This study aims to investigate four qualities of positive emotions that are relevant for product design, see *Table 3.1*. To develop an understanding of these qualities a semi-qualitative study was undertaken in which users and designers were asked to rank twenty-five positive emotions. The reasons that participants had for their ranking were investigated using semi-structured interviews.

		Participant groups	
		Users	**Designers**
Qualities	First quality	Frequency of experience How often do you experience this emotion in relation to products?	Preference for elicitation How strong is your preference to design products that evoke this emotion?
	Second quality	Preference for experience How strong is your preference to experience this emotion in relation to products?	Difficulty of elicitation How difficult is it to design products that evoke this emotion?

Table 3.1. *Qualities used to rank positive emotions*

3.1.2 *Participants*

The participants to this research were twenty-nine of whom fifteen were users and fourteen designers. The number of participants selected for this study was influenced by the objective to understand the decisions made during the ranking employing interviews. Undertaking research of this type implies a focus on small populations to maintain the quality of the data collected and analysed. The users (eight males and seven females) were not involved in or related to the discipline of product design. Most of them had background in engineering (including mechanical, aeronautical, biomechanical, and biochemical engineering). They were between 22 and 34 years old (M=28.33; SD=3.77). All but one user were postgraduate students at Imperial College London and were recruited from its departments. The designers (ten males and four females) had background in design (including industrial, interior, and furniture design). They were between 24 and 41 years old (M= 30.36; SD= 4.40) and had an average experience of six years (Min. 1 year, Max. 13 years; SD=3.38). Most of them had a postgraduate degree from design faculties in the following universities: Carnegie Mellon, Royal College of Art, and TU Delft. All participants had a good command of English and 15 were native speakers.

3.1.3 *Material*

Twenty-five positive emotion terms and their definitions as identified by Desmet (2012) were printed out on cards (white paper sheets of 5 cm by 10 cm), see *Table 3.2*.

Name	Definition
Admiration	To experience an urge to prize and estimate someone for their worth or achievement
Amusement	To enjoy a playful state of humour or entertainment
Anticipation	To eagerly await an anticipated desirable event that is expected to happen
Confidence	To experience mental or moral strength to withstand or cope with the situation
Curiosity	To experience an urge to explore, investigate, or to understand something
Desire	To experience a strong attraction to enjoy or own something
Dreamy	To enjoy a calm state of introspection and thoughtfulness
Enchantment	To be carried away by something that is experienced as overwhelming pleasant
Energetic	To enjoy a high-spirited state of being energized or vitalized
Euphoria	To be carried away by an overwhelming experience of intense joy
Fascination	To experience an urge to completely focus one's attention to something
Hope	To experience the belief that something good or wished for can possible happen
Inspiration	To experience a sudden and overwhelming feeling of creative impulse
Joy	To be pleased about (or taking pleasure in) something or some desirable event
Kindness	To experience a tendency to protect or contribute to the well-being of someone
Love	To experience an urge to be affectionate and care for someone
Lust	To experience a sexual appeal or appetite
Pride	To experience an enjoyable sense of self-worth or achievement
Relaxed	To enjoy a calm state of being free from mental or physical tension or concern
Relief	To enjoy the recent removal of stress or discomfort
Respect	To experience a tendency to regard someone as worthy, good or valuable
Satisfaction	To enjoy the recent fulfilment of a need or desire
Surprise	To be pleased by something that happened suddenly, and was unexpected or unusual
Sympathy	To experience an urge to identify with someone's feeling of misfortune or distress
Worship	To experience an urge to idolize, honour, and be devoted to someone

Table 3.2. *Twenty-five positive emotions*

To help the respondents rank the emotions, we used four A3 white paper sheets divided into five columns. The first and the fifth columns of the ranking sheets were marked with the following headings: 1) 'infrequently experienced' and 'frequently experienced'; 2) 'I would not like to experience' and 'I would like to experience'; 3) 'I would not like to elicit' and 'I would like to elicit'; 4) 'easy to elicit' and 'difficult to elicit'. The choice of a five point scale is based on trials conducted during a pilot study.

3.1.4 *Procedure*

The session started by presenting the twenty-five emotion cards. Participants reviewed them and were asked to take out those that they were not familiar with. Then they were told that this study focused on durable products, which were defined to them as manufactured items expected to have a relatively long useful life after purchase, e.g. household appliances. They were subsequently informed that the task consisted of ranking the twenty-five emotions against two qualities and that their ranking would be used as the starting point for an interview. Next, they were asked to rank the emotions based on the first quality, see *Table 3.1*. After the first ranking, the participants were interviewed with the intention to generate insights about their choices. Next, the participants were asked to rank the emotions based on the second quality, which was also followed up by an interview. At the end of each ranking a photograph was taken for further analysis. The interviews were completed in approximately 30 minutes and were audio recorded and transcribed. The questions asked during the interview can be found in *Appendix 2*. The study was completed individually in a quiet room see *Figure 3.1*.



Figure 3.1. *A typical setup of the study*

3.2 *Results*

This section presents the results focusing first on the users and then on the designers.

3.2.1 *Users*

Users were, in general, familiar with the twenty-five emotions. However, dreamy, euphoria, and worship were taken out of the study by three participants, while lust and enchantment by two. The average values for both qualities (i.e. preference and frequency) were calculated for each emotion and are plotted in *Figure 3.2*, while the actual numerical values are in *Appendix 3*.

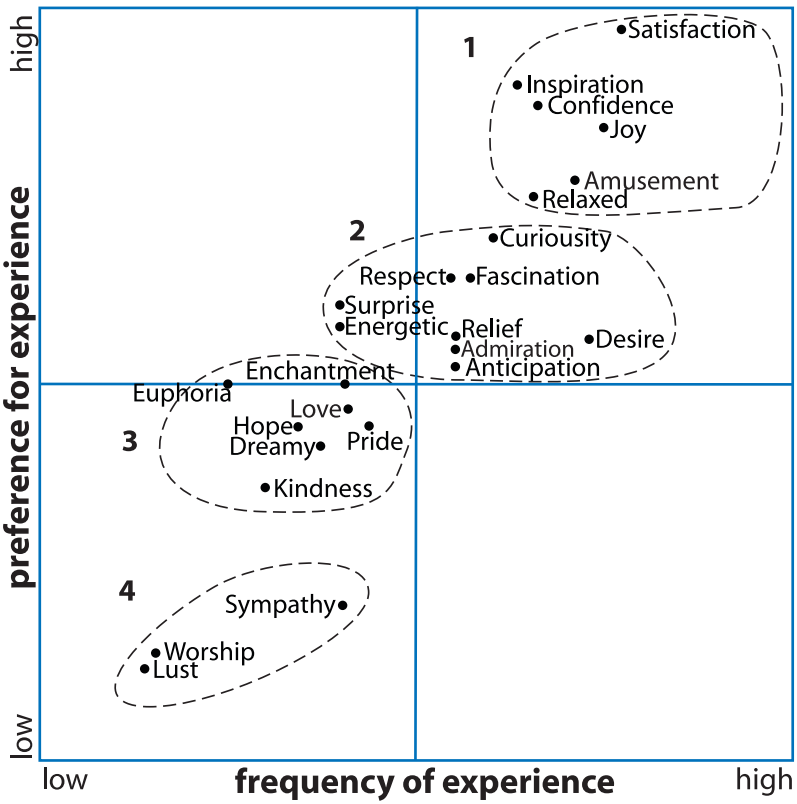


Figure 3.2. *User results per emotion based on frequency and preference*

*Figure 3.*2 shows that the emotions follow a diagonal pattern, from the bottom-left quadrant to the top-right quadrant. This indicates that the less preferred emotions were also the less experienced ones, and vice versa. Based on this tendency, four groups of emotions were identified, see *Figure 3.2*. Group 1 includes emotions that were highly preferred and frequently experienced. Group 2 includes emotions that were moderately preferred and experienced. Group 3 includes emotions that were moderately disliked and infrequently experienced. Finally, Group 4 includes emotions that were highly disliked and infrequently experienced.

Frequency of and preference for experience

Group 1 includes six emotions: satisfaction, joy, confidence, inspiration, amusement and relaxed. In general, a sign that these emotions were frequently experienced

is that users could easily recall them and provide examples as well as link them to products. An example of the latter is: U10 '*I have a music instrument that I feel relaxed and joyful with*'. Regarding preference, three reasons were identified to explain why users would like to experience them with durable products. First, they like to experience these emotions because they bring goodness and pleasure. An example of this is: U15 '*I would like to feel these emotions because these are emotions that I like to feel, like in a day to day basis*'. Second, they think that experiencing these emotions is valuable; it is a sign of having made a good product choice because the product fulfills their needs. An example of this is: U11 '*It is quite important that you develop a kind of satisfaction, confidence and respect, especially in products that you need*'. Third, they believe that these emotions are expected from human-product interactions. An example of the latter is: U14 '*At the end of the day when you buy something you want to get satisfaction from it, you want to be amused by it, you want it to bring you joy. I think that confidence is also important; you do not want something that you cannot trust or rely on*'.

Group 2 includes nine emotions: curiosity, respect, fascination, surprise, energetic, relief, desire, admiration and anticipation. Three reasons were identified to explain why they are moderately preferred and experienced. First, these emotions may be suitable just for some product categories or situations. An example of this is: U14 '*I experience anticipation only with some products, perhaps the feeling is boosted because you have to wait longer to get it*'. Second, these emotions seem less interesting than those in Group 1. An example of this is: U1 '*Relief is experienced when the product has done its job, it has performed its function*'. Third, experiencing some of these emotions seems to raise moral concerns. An example of this is: U6 '*When experiencing admiration, the focus is on the product and I feel manipulated*'.

Group 3 includes seven emotions: euphoria, enchantment, love, pride, hope, dreamy, and kindness. One reason was identified to explain why they are infrequently experienced and moderately disliked. Users seem to reject the idea of experiencing these emotions towards products. Two examples of the latter are: U5 '*I do not get particularly enchanted or euphoric about a product; nothing really stretches up to the point where satisfying like, or well, I get those great wings of moods about products*' and U13 '*I do not think that you can be kind to a product, or to love it*'.

Finally, group 4 includes three emotions: lust, worship, and sympathy. Users found

difficult to recall or associate these emotions to products. An example of the latter is: U1 '*I just do not associate these emotions with products*'. In addition, users reject the idea of experiencing these feelings towards products. Two examples of this are: U2 '*I do not worship products. I do not lust products. I do not want to love products at all*' and U7 '*I do not want to be slave of any product, so I do not want to worship any product. Similar to pride and love, I do not want to have a passion for products*'.

Additional findings

Based on their preferred emotions, participants reported to have a good impression of products which elicit positive emotions. Examples of their answers are: U1 '*I trust the product if it provides positive emotions*', U12 '*If I have a product that elicits these positive emotions, I would make opportunities to use it more, I would show it off, and promote it*', and U13 '*If a product makes me feel these positive emotions I would think that: it works, I would use it a lot, I would recommend to other people, I may find out more about how it works. I may buy something related to that product or made by the designer of that product*'.

Participants mentioned that some of the twenty-five emotions are associated to very specific moments of the human-product relationship. For example, anticipation, desire, and curiosity are emotions that they reported to experience before they own a product. An example of the latter is: U11 '*Curiosity may not last long. You are curious at the beginning but the more you know about the product the less curious you are*' and U12 '*Desire, anticipation, you can feel these before owing the product*'.

3.2.2 *Designers*

Designers were, in general, familiar with the twenty-five emotions. However, enchantment, lust, and worship were taken out of the study by two participants. The average values for both qualities (i.e. preference and difficulty) were calculated for each emotion and plotted in *Figure 3.3*, while the actual numerical values are in *Appendix 3*.

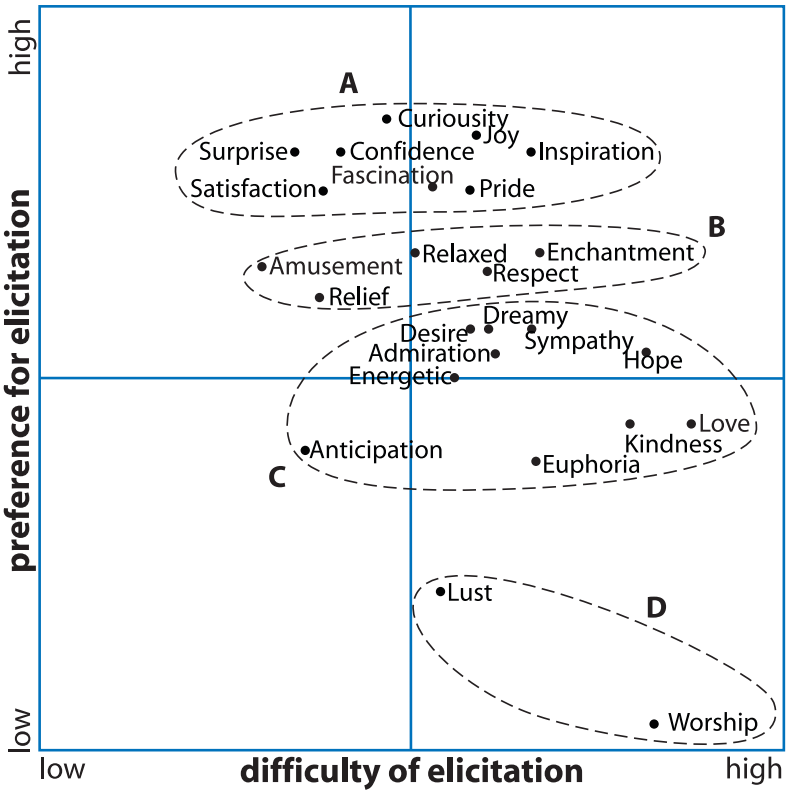


Figure 3.3. *Designer results per emotion based on difficulty and preference*

Figure 3.3 shows that emotions follow a pattern from the bottom-right quadrant to the top-left and top-right quadrants with a concentration of emotions in the upper quadrants. Based on this tendency four groups of emotion were identified, see *Figure 3.3*. Group A includes emotions that were highly preferred and are not particularly difficult or easy to elicit. Group B includes emotions that were moderately preferred, and are not particularly difficult or easy to elicit. Group C includes emotions that did not stand out in preference and tend to be difficult to elicit. Finally, Group D includes emotions that were not preferred by designers.

Preference for and difficulty of elicitation

Group A includes eight emotions: curiosity, joy, confidence, inspiration, surprise, fascination, satisfaction, and pride. These emotions were highly preferred and not

particularly difficult or easy to elicit. Three reasons were identified to explain why designers highly prefer to elicit these emotions. First, they think that these emotions are appropriate for the designs that they make. An example of this is: D2 '*I think confidence is really important with medical devices, especially if you got clinical requirements, you want users to be confident that it is going to provide them the service that they require*'. Second, they have a sense of responsibility to elicit these emotions through designs. An example of this is: D5 '*I think that design should offer more than just people being happy with the product, so I feel that I should really bring about curiosity, fascination, and inspiration to them in some way*'. Third, they are personally interested in eliciting these emotions through their designs. An example of this is: D10 '*I think that curiosity, desire, and confidence are very important in my designs, and they always should integrate those feelings*'. Regarding difficulty, two reasons were identified to explain why they lie in proximity of the midpoint of this quality. First, designers think that they can rely on their training and skills to elicit these emotions. An example of this is: D4 '*I just think that it is part of the training that we all got in product design. I think that is part of how we look at the world. I guess it is just embedded in our education, this is the goal, this is what you need to achieve, and you train yourself to recognise it and design for it*'. Second, these emotions seem to be more tangible. An example of this is: D12 '*I guess these ones are easier because you can make things and mechanism that make feel people curiosity and even fascination. I guess you can make people proud by making things that are attractive and valuable. It is not that easy but it is not that hard*'.

Group B includes five emotions: relaxed, amusement, respect, enchantment, and relief. These emotions were moderately preferred and not particularly difficult or easy to elicit. Two reasons were identified to explain why designers moderately prefer to elicit these emotions. First, these emotions seem to be the outcome of good design practice. An example of this is: D1 '*For relief, I would like users to feel glad that they found something that it is easy to use and meets their needs. Once that they are using it I hope they feel relaxed using it free from many concerns*'. Second, some of these emotions are linked to specific contexts or products. An example of this is: D11 '*I am sure that if I was doing something in which the target market was children then amusement would be a more commonly used word, but normally I am dealing with adults*'. Regarding difficulty, one reason was identified to explain why

they lie in proximity of the midpoint of this quality. There are already products that trigger these emotions. An example of this is: D4 '*These emotions are hard to achieve but we kind of know what we are aiming for. A lot of Alessi products are related to amusement and enchantment. We have seen examples that play on those emotions*'.

Group C includes ten emotions: dreamy, desire, sympathy, admiration, hope, energetic, anticipation, love, kindness, and euphoria. These emotions did not stand out in preference and tend to be difficult to design. Five reasons were identified to explain why designers did not prefer these emotions and why they perceived them as difficult to elicit. First, designers seem to reject some of these emotions. An example of this is: D11 '*For me at least if we start to talk about objects being desirable it has slightly a negative connotation. I want objects to be compelling not necessarily desirable*'. Second, they see these emotions as unpredictable or uncontrollable. An example of this is: D2 '*I think a lot of these emotions, sympathy, surprise, love, worship, are feelings that are really unpredictable and each person has a different response to these*'. Third, they think that some are very intense emotions to be elicited through artefacts. An example of this is: D11 '*For me euphoria is such a high state. It is not necessarily something that you can design for*'. Fourth, these emotions seem to be beyond designers' skills. An example of this is: D10 '*Actually, many products that people love they were not design for love, they just end up being loved objects. So, I think that it is a consequence of other issues*'. Finally, there is a lack of knowledge about these emotions. An example of this is: D4 '*All these emotions, they are all newer in terms of needing to design for, and they are not engrained in our process, in our thinking, in our internal design radar and evaluation criteria*'.

Group D includes two emotions that designers would not like to elicit through their designs and these are: worship and lust. Designers reject the idea of trying to elicit these emotions through their designs. An example of this is: D9 '*Worship because it feels a bit dishonest. I could never say I want someone to worship or idolise or anything, I think quite the opposite. Nobody should depend that much on these designs*'. Designers also think that worship is too difficult to elicit. An example of this is: D1 '*Worship would be an extreme reaction not very suitable to most human-product interactions and I mean, if someone were worshiping the software or the person who wrote it I would start thinking in terms of restraining orders rather than being flattered and the same with lust*'.

Additional findings

Nearly all participants mentioned that they had intentionally tried to elicit positive emotions. Two were the strategies that they recognised to adopt in the elicitation of positive emotions. The first is self-experimentation. A typical example described by a designer was: D6 '*the process I usually follow is, I prototype something, test it in lots of people to get their reactions, test what emotional reactions they do have and then tweaking it and test it again until you found out the variable that makes people feel joy or the variable that makes people feels satisfaction because these are really intangible emotions*'. Similarly, another designer explained: D11 '*things like joy, enchantment, fascination, surprise that is more difficult. I think those are more intangible things and they differ between groups of individuals, so they are contextual matters that one would need to deal with in order to deliver on those, that would be more through ethnographic approach. Expending time with people, inviting them to be part of the development process, seeing actually how they respond to things, if I see that something is eliciting a positive response then I would try to understand what has elicited that*'.

The second strategy consists of creating a solid concept. A designer explained: D6 '*The most important thing is defining the concept. From the objects that I make most of these emotions are related to aesthetics, and what I mean for aesthetics is not like the superficial treatment but it is also the way the object is generated, the concept from which the shape takes form. Each theme concept gives me the tools to define the design*'. Similarly, another designer explained: D7 '*I would like to have a good concept that I can transmit to people and that would be meaningful for them*'.

These findings are in line with previous research by Porter et al (2008), who found that designers have traditionally satisfied the emotional and aspirational needs of consumers through intuitive techniques rather than formal methodologies.

3.3 *Discussion*

In this research we have characterised emotions based on the frequency with which users experience them and the preference for experiencing them. We have also investigated emotions based on designers' preference for eliciting them and the difficulties in achieving it.

First, the results of this research have shown that users and designers can distinguish the variety of positive emotions that were introduced to them in this research. This is important because pleasant experiences embody many types of positive emotions. Second, users and designers were able to rate the emotions. This indicates that users and designers are aware of emotions in general and the qualities studied in this research in particular. This result, however, happened in a set-up in which the twenty-five positive emotions were presented to both groups. Previous research has identified that design students find difficult to articulate names of positive emotions (Desmet, 2012). It seems that the design students had not developed the emotional granularity, which influences the choice of emotions to design for. It is noteworthy that the strategies that designers rely upon to evoke emotions are intuitive rather than systematic (see also Porter et al 2008). Third, the research found that users rated almost 60% of the emotions in the *high* part of the *preference for elicitation* quality. This indicates a desire from users to be in contact with products that can initiate these experiences. Fourth, users rated 48% of the emotions in the *low* part of the *frequency of experience* quality. This suggests that within the context of human-product interactions almost half of the emotions are not often present in the life of these subjects. Considering the two results for users it seems that further research is needed to establish if the emotions that are not preferred and not present in the life of users are an opportunity for design or the nature of these emotions is such that they cannot be frequently experienced. Fifth, the designers rated almost 70% of the emotions in the *high* part of the *difficulty of elicitation* quality. This suggests that designers think that it is difficult to elicit positive emotions. The main reason given was that emotions are very intense, e.g. love, worship, inspiration, and euphoria. Sixth, designers rated approximately 72% of the emotions in the *high* part of the *preference for elicitation* quality. This indicates that many emotions are of interest to them. Considering the two results for designers it seems clear that as much as they are interested in emotions they are also aware of the challenges involved in designing them. In this study we identified that to elicit positive emotions designers rely on either self-experimentation or solid concept definition, which are empirical rather than systematic approaches to emotional design.

From now on the results from the research with users and designers are discussed together with a focus on the *preference for experience* and *preference for*

elicitation qualities, and sometimes consideration of the other two qualities. The research showed that there are situations of more or less agreement with respect to how users and designers respectively see their preferences for experiencing and eliciting emotions. Emotions such as satisfaction, inspiration, confidence, joy, amusement, and relaxed indicate an agreement between the two groups as designers have a preference for eliciting them, and users want to experience them. The reasons underlying the preference assigned to these emotions by the two groups are, however, not the same. Users would like to experience them because they are pleasant, expected, and indicative of good product choice. Designers, on the other hand, would like to evoke these emotions because they are of interest, appropriate to their designs, and their elicitation is perceived as a responsibility.

Emotions such as lust and worship indicate also an agreement between the two groups as designers have a very low preference for eliciting them and users do not want to experience them. It seems that these emotions are weakly linked to human-product interaction and they cause ethical or moral concerns in both groups. Future studies can confirm this by directly investigating positive and negative aspects of experiencing these emotions with products.

Finally, the last instance of agreement between the two groups comes from emotions such as hope, love, desire, admiration, dreamy, and energetic, as users and designers attribute average preference to experiencing and eliciting them. This is influenced by the understanding of the emotion, and personal preferences and self-defined boundaries in relation to the emotion, i.e. some people think that it is fine to love objects, while others think that it is out of consideration. It seems that these emotions are affected by personal values and there is a need to undertake further research to clarify this issue.

Emotions like surprise, pride, and enchantment indicate a deviation between the preferences of the two groups. Designers, in fact, seem to be keener in eliciting them than users are in experiencing them. This may be the result of the specific interests of the two groups. We will explain this with the case of pride. The interest of designers in pride may be due to its positive effect on people's self-esteem. On the contrary, users mentioned that some products help them show how they want to be perceived. This is a self-centred reason. Previous research about pride has shown that it is important in social interactions and gives self-esteem its affective kick (Tracy

and Robins, 2007). These researchers also explain that there are two sides of pride. One side is related to one's successes, relationships, and altruism. The other side is related to the hubristic, sinful, or defensive pride, that is more associated with narcissism (Tracy and Robins, 2007). It may have happened that users focused on the narcissist side of pride, i.e. its negative side. Future research may help understand if, when there is shared interest by users and designers, the positive side of pride emerges and if the same happens with surprise and enchantment.

Limitations and further work

This study is based on four predefined qualities of emotions that are relevant for product design. The results are general and may vary based on product category, e.g. house appliances versus tools. Similarly, there may be some emotions that are inappropriate for some products, e.g. surprise for medical equipment. This, however, is still unclear and needs further research. The results may also be cultural dependent. Cultures differ in how they value positive emotions, e.g. North America and Latin America (Diener et al, 2000; Hofstede, 1991; Tracy and Robins, 2007; Ortíz Nicolas and Hernández López, 2008). Studies carried out in different cultural contexts as well as with different age and gender groups may lead to differences in the results (Porter et al, 2008). Another limitation is that people relied on their recalls to rank the emotions and it was done in a setup environment. Ecological contexts can offer more precise knowledge. The four qualities studied were defined based on their relevance to product design and these are independent of the emotions. For example, positive emotions can be organised based on how pleasant or exciting they are. These dimensions are emotion-dependant. Finally, this study relies upon small populations of users and designers, and therefore more research is needed to confirm and generalise its findings.

3.4 *Conclusions*

This chapter has presented research to investigate a set of twenty-five positive emotions from the perspective of four qualities assigned to emotions that are relevant to product development, i.e. frequency of experience and preference for experience by users, and preference for elicitation and difficulty of elicitation by designers. The main contribution of this study to the field of user experience is the characterisation of each of the twenty-five positive emotions in relation to the four studied qualities. For instance, the emotions preferred by users and designers were identified along with the reasons to justify preferences.

Studying positive emotions we touched on one of the core aspects of user experience and acted towards designing for pleasant experiences. To fulfil this aim it is important to identify and understand the emotions that can enhance user experience and increase users' well-being. Based on the results of this study, we conclude that users have a clear preference for certain emotions and they would like their durable products to evoke them. These are satisfaction, inspiration, confidence, joy, amusement, and relaxed. Users also reported that a product, which elicits positive emotions will most likely increase frequency of use and likelihood of being recommended to other people. Overall, the results of the research suggest that users are keen to have encounters with products that enhance pleasant experiences. Designers would like to elicit several of the emotions that users want to experience and were found to be keen to enhance pleasant experiences through their work. For a pleasant experience to occur there is a need to align the emotions expected by users and those aimed at by designers. With respect to the difficulty of eliciting positive emotions through durable products, the conclusion is that it is a challenging task, and little knowledge exists to support designers. This scenario offers opportunities to carry out research on positive emotions and product design. It is important to report that the knowledge developed in this study emerged by prompting participants with emotional names.

Chapter 04

Pleasantness and Arousal of twenty-five Positive Emotions

* * *

In the field of psychology scholars tend to agree that emotions involve various dimensions or modalities (Scherer, 2005; Frijda, 1986; Russell, 2003; Roseman and Smith, 2001). Expression, bodily arousal and subjective experience are examples of these dimensions (Scherer, 2005). In particular two dimensions that have captured scholars' attention are pleasantness and arousal. These recognise that emotions can be pleasant or unpleasant as well as calm or exciting. Pleasantness characterises the hedonic valence of an emotion, while arousal its bodily symptom. Based on the idea that all affective states arise from these two dimensions, Russell (2003) has captured them into the concept of core affect. These dimensions have also led to the development of tools to measure human emotions, which have been adopted in user experience research (Vastenburg et al, 2011; Laurans et al, 2012; Desmet, 2002). For example, the self-assessment manikin, known as the SAM method, is based on a series of human cartoons that are used to measure, among others, pleasantness and arousal (Lang, 1980).

Emotions colour experiences (McCarthy and Wright, 2004) and the shade can depend on their pleasantness and arousal. For example, it is expected that pleasant experiences with products trigger various positive emotions. In a similar line, pleasant experiences can be enhanced by either calm or exciting emotions. These two types of experiences can be very pleasant but resulting from different situations. For design practice it is important to know what emotions are more pleasant because people generally (but not always) seek behavioural options that maximise pleasure and minimise displeasure (Russell, 2003; Heknert et al, 2007). Users' preference may be directed towards products that enhance pleasant experiences. In addition, arousal is relevant because intense emotions were perceived by designers as more

difficult to design for (Ortiz Nicolas, et al, 2013).

Pleasant experience is an umbrella term and as a result it is too general to understand or design for. To overcome the limitations of umbrella terms a set of positive emotions that are relevant for product design was identified (Desmet, 2012). However, there is little knowledge about the differences between these emotions. The aim of this study is to investigate the pleasantness and arousal of twenty-five positive emotions in relation to durable products.

4.1 *Products and emotions*

It is well established that products elicit emotional responses in people (Fridja, 1986; Desmet, 2002; Norman 2004). However, there are emotions that are more suitable for human-product interaction that others. To identify them, Desmet (2002) assembled a list of positive and negative emotions based on studies carried out in the field of psychology. A group of users rated the pre-defined list of emotions to establish which are frequently triggered by products. A challenge of this approach, however, is that it relies on participant's recall. To overcome this issue, Desmet used collages showing products from different categories to stimulate participants' recall regarding emotional experiences. A similar study including the employment of collages and a list of emotions was carried out by Ortiz Nicolas and Hernandez Lopez (2008) to identify product relevant emotions in a new cultural context. More recently, Desmet (2012) reported the use of six collages to identify positive emotions evoked by products. In this study, however, Desmet reported that the collages were used to give participants an idea of the possibilities that they might consider instead of being only a recall tool. In conclusion, all these studies started with pre-defined lists of emotions, which were presented to users through questionnaires, and employed collages to stimulate their recall.

4.2 *Understanding two dimensions of twenty five positive emotions*

This section presents the process followed to carry out this study including the research approach, the participants, the material and the procedure.

4.2.1 *Research Approach*

As shown earlier, previous studies have investigated emotions using questionnaires and collages. Building on this work, this research relies on the use of a questionnaire to identify the pleasantness and arousal of an emotion set. The main difference of this research from previous work is that it aims to identify basic dimensions of emotions, i.e. pleasantness and arousal, rather than their relevance to product design, which has been already identified in (Desmet, 2012).

Research in the field of psychology has traditionally used bipolar dimensions for both pleasantness and arousal (Russel, 2003; Scherer, 2005). For example, it has employed a bipolar descriptor for pleasantness such as pleasant-unpleasant (Scherer, 2005). This study, instead, due to its focus on positive emotions, has employed a monopolar descriptor for pleasantness such as pleasant-very pleasant. For arousal, differently, it has relied on a traditional bipolar descriptor such as calm-excited because this dimension does not have a negative connotation.

4.2.2 *Respondents*

Fifty-nine respondents participated to this study (thirty-seven males and twenty-two females). The number of respondents was defined based on figures used in previous and comparable studies (see Desmet, 2002; Ortíz Nicolás, 2008) and the requirement to compute statistical analysis. The subjects were selected on the basis of the degree of homogeneity of their educational level. The respondents were from various nationalities; among these French and British were the two most recurrent nationalities. Participants had no relation to the fields of product or industrial design. Most of them were students enrolled at Imperial College London. Forty-five were undergraduate students, seven postgraduate students, and the remaining seven

professionals. Participants were between 19 and 39 years old (mean = 23.73; SD = 5.47). They all had a good command of English and eleven were native speakers.

4.2.3 *Material*

The material used in this study includes a questionnaire, a set of instructions, and five collages.

A two-part questionnaire was developed. In the first part participants answered demographic questions, about age, gender, and background. In the second part, participants rated twenty-five positive emotions in relation to pleasantness (from '1 = pleasant' to '5 = very pleasant') and arousal (from '1 = calm' to '9 = excited'). The questionnaire used is in *Appendix 4*. The emotions used in this research are: admiration, amusement, anticipation, confidence, courage, desire, dreamy, enchanted, energetic, euphoria, fascination, hope, inspiration, joy, kindness, love, lust, pride, relaxed, relief, respect, satisfaction, surprise, sympathy, and worship. These emotions were identified by Desmet (2012). Three versions of the questionnaire were generated with a randomised order of the emotions.

Written instructions were developed to clarify the concepts of pleasantness and arousal to participants and presented to them in A4 paper sheets. The instructions are in *Appendix 5*.

Five collages depicting a large variety of daily used products were employed. These were borrowed from a previous study (Desmet, 2012). The collages were printed out in high quality colour A3 paper sheets, see *Figure 4.1*.

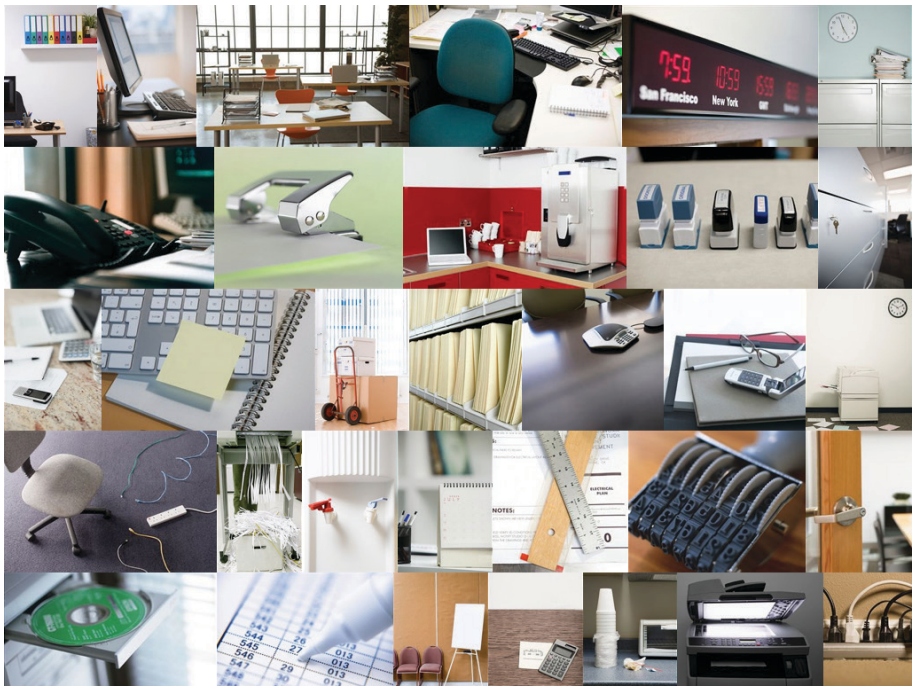


Figure 4.1. *A collage to stimulate participants' recall*

4.2.4 *Procedure*

Three key parts of the procedure are explained next. First, participants were informed that the focus of the study was on positive emotions and durable products, which were defined to them as manufactured items that are expected to have a relatively long useful life, e.g. a bike, a kettle, and a digital camera. Second, participants received five collages with the intention to stimulate their memory and they were allowed to look at them for approximately 30 seconds each. A similar time was used in previous studies reported in *section 4.1*. Third, participants received written instructions to fill in the questionnaire, in which the concepts of pleasantness and arousal were explained. Respondents were also informed that they could cross over the emotions that they felt that they did not experience through durable products. Participants took an average of 15 minutes to fill in the questionnaire. The procedure was carried out individually in a quiet room.

4.3 *Results*

This section presents first the emotions that participants indicated as not experienced with durable products, and then the results about the pleasantness and arousal of the emotions.

Nineteen participants (32% of the total) removed at least one emotion indicating that they did not experience certain emotions with durable products. The emotions that were more frequently crossed over are reported next: worship (25%), sympathy (19%), lust (15%), love (12%), kindness (10%) and respect (10%).

The pleasantness and arousal of the emotions are displayed in *Table 4.1*.

Emotion name	N	Pleasant		Arousal	
		Mean	SD	Mean	SD
Joy	59	4.56	0.73	6.47	1.58
Love	52	4.42	0.82	6.35	1.93
Satisfaction	59	4.27	0.98	5.02	2.20
Amusement	59	4.19	0.90	6.85	1.46
Euphoria	58	4.19	1.08	7.31	1.89
Inspiration	59	4.15	0.94	6.29	1.97
Energetic	58	3.97	1.23	7.69	1.50
Confidence	59	3.97	1.00	4.98	2.00
Desire	59	3.86	1.01	7.00	1.58
Fascination	58	3.79	0.87	5.69	1.88
Relaxed	59	3.66	1.29	2.68	2.10
Relief	59	3.73	1.19	3.63	2.02
Lust	50	3.58	1.20	7.04	1.97
Kindness	53	3.57	1.14	3.87	1.90
Pride	59	3.42	1.13	5.02	2.19
Enchantment	58	3.31	1.33	4.95	2.40
Dreamy	59	3.24	1.28	3.10	2.47
Surprise	58	3.19	1.25	6.28	1.99
Anticipation	59	3.12	1.27	6.02	2.04
Courage	58	2.93	1.30	5.66	2.28
Admiration	59	2.90	1.12	4.36	1.94
Hope	59	2.78	1.35	4.95	1.92
Worship	44	2.76	1.38	4.64	2.53
Respect	53	2.64	1.39	3.15	1.89
Sympathy	48	2.63	1.38	3.08	2.07

Table 4.1. *Pleasantness and arousal of emotions* (N=no of responses; M=mean; SD= standard deviation)

To develop deeper understanding of the data in *Table 4.1*, the emotions were mapped using a graphical method known as the circumplex diagram of emotions (Russell, 2003), see *Figure 4.2*. In the diagram the pleasantness dimension increases along the radius of the circle, while the arousal dimension along its circumference. It is noteworthy that *Figure 4.2* shows a half-circle diagram because the focus of this study is on positive emotions.

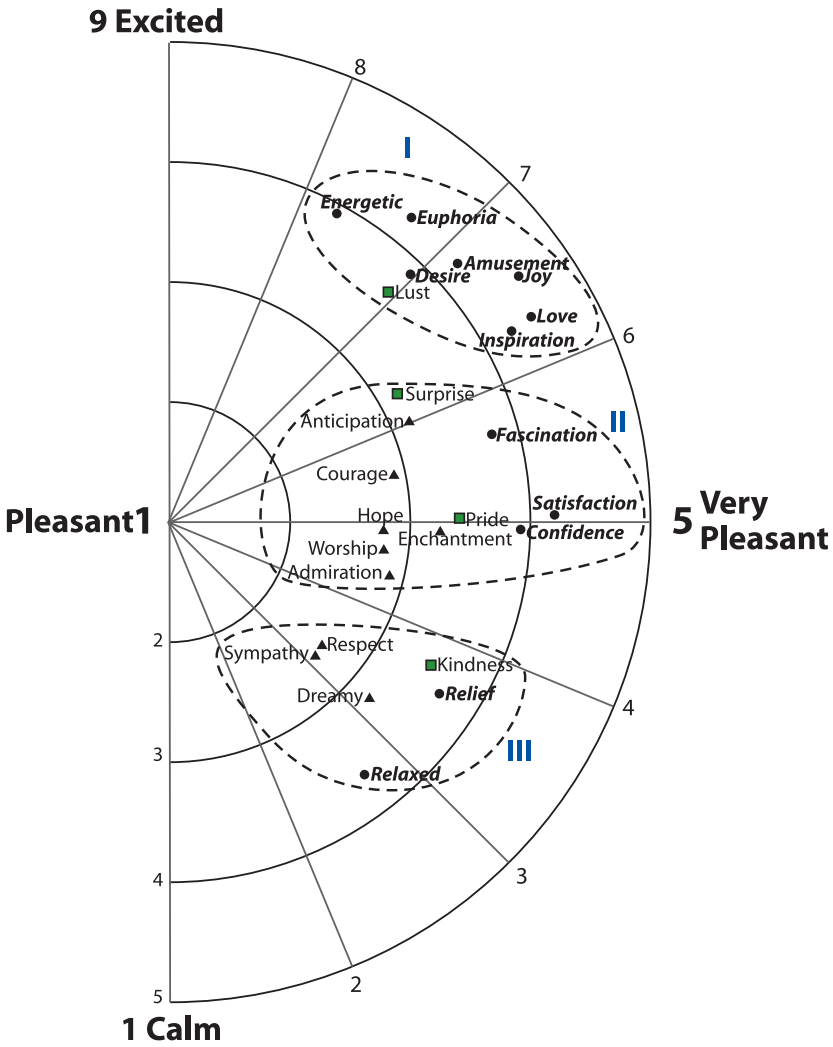


Figure 4.2. *Pleasantness and arousal of the emotions in the Circumplex diagram*

To identify differences between the emotions, cluster analysis was applied to the data. The analysis was computed using Ward's method and applying squared Euclidean distance as the similarity measure for each dimension. The emotions indicated significant difference along the arousal dimension, which led to the identification of three groups, namely *exciting*, *median* and *calm* emotions. In *Figure 4.2* these emotion groups are shown using a dotted line. This result fits well with the theory on emotions, which has suggested that a fundamental difference between emotions is in the way in which they are felt (Russell, 2003; Scherer, 2005; Varela et al, 1991). For the pleasantness dimension the cluster analysis also showed three groups, namely *pleasant*, *mildly pleasant* and *very pleasant*. In *Figure 4.2* these emotion groups can be identified by a triangle, a square and a circle icon.

Eight emotions were found to be exciting and very pleasant, namely energetic, euphoria, amusement, desire, joy, love, inspiration, and lust, see group I in *Figure 4.2*. This group includes more pleasant emotions than the other two groups. To explain this result it is worth considering that the physical stimulation of the human body is the key aspect characterising these emotions. Hence, it can be that exciting emotions made participants more aware of the pleasantness of emotions. The pleasantness of emotions has also been explained as the result of consistency of the users' motivation towards the progression of a goal (Carver and Scheier, 1990). It seems that some emotions in this group align well with this theory such as amusement, desire and lust. For example, experiencing amusement after playing music with friends may be seen as an example of progression towards relatedness. On the other hand it is unclear if experiencing inspiration, euphoria, or love are the result of the progress towards a goal.

Eleven emotions were found to be median in arousal and varying in pleasantness from low to high, namely fascination, satisfaction, confidence, pride, anticipation, enchantment, surprise, courage, hope, worship, and admiration, see group II in *Figure 4.2*. This group includes the largest number of emotions from the studied set, indicating that in the set there are more median arousal emotions in comparison to exciting and calm emotions. On the other hand, three level of pleasantness were identified in this group. Three emotions that are part of this group are very pleasant, i.e. satisfaction, confidence, and fascination. These emotions may be elicited in users based on product's instrumental functions, which may explain why they are not

very exciting. Their pleasantness can still be explained by the motive consistency theory (Carver and Scheier, 1990). There are three emotions that are mildly pleasant, i.e. surprise, enchantment, and pride. These emotions may be less pleasant due to limited opportunities of experiencing them through products, e.g. there are less products that trigger surprise in comparison to satisfaction. In addition, there are five emotions that are pleasant, i.e. anticipation, courage, hope, admiration and worship. These emotions may be less pleasant than the others because they are more suitable for humans or they are rarely experienced with products, e.g. worship is the least experienced emotion with products (reported by 25% of participants as shown in *Table 4.1*).

Finally, six emotions were found to be calm and varying in pleasantness from low to high, namely relaxed, relief, kindness, dreamy, respect, and sympathy, see group III in *Figure 4.2*. This is the smallest group of the three, which indicates that there are less calm emotions in the studied set than median or exciting ones. This group includes only two very pleasant emotions, i.e. relaxed and relief, one mildly pleasant, i.e. dreamy, and two pleasant emotions, i.e. respect and sympathy. This group also includes three emotions that were frequently reported as not experienced with products, i.e. sympathy, kindness, and respect. It is unclear if this happened because of the nature of emotions (calm) or it is related to the suitability of these emotions for human-product interactions.

4.4 *Discussion*

The aim of this study was to investigate the pleasantness and arousal of twenty five positive emotions. The most pleasant emotions identified in this study (48% of the emotions) are amusement, joy, satisfaction, desire, inspiration, relief, confidence, fascination, euphoria, energetic, love, and relaxed. In our study in *Chapter 3* all of these emotions, except euphoria, were found to be among those preferred by users (Ortiz Nicolas, et al, 2013). In addition, the interviews conducted with those users indicated that the pleasantness of these emotions is the main reason to prefer them. The aims of this study and that in *Chapter 3* were different; nevertheless, they point

in the same direction, i.e. users prefer to experience the most pleasant emotions. The experience of the most pleasant emotions is a clear indication of the 'valence' of an experience.

Arousal

In relation to the arousal dimension, exciting emotions (32% of the emotions) are energetic, euphoria, amusement, joy, desire, love, inspiration and lust. These emotions may play a significant role in making products more noticeable, e.g. approaching a car that triggers inspiration. We speculate that exciting emotions may also play an important role in product purchase. On the other hand, calm emotions (24% of the emotions) are sympathy, respect, kindness, dreamy, relax, and relief. These emotions seem to be experienced after a person has been engaged with a product for a long period of time. The results that there are less calm emotions, e.g. relaxation, relief, and dreamy, than exciting ones and that some calm emotions were reported as not experienced deserve further consideration. Research on emotions has suggested that there are more negative basic emotions than positive ones (see a comparison of views in Ortony and Turner, 1990); and that basic emotions tend to be exciting, e.g. anger, fear, anxiety, joy, and happiness. The latter may indicate that human beings have developed a richer language to describe exciting states in comparison to calm states. It would be interesting to study calm experiences with products in detail to identify if there is a similar richness of emotions as there is for exciting experiences.

Pleasantness

The motive consistency theory (Carver and Scheier, 1990) was used earlier to explain the pleasure of some emotions, e.g. satisfaction, confidence, joy, amusement, anticipation, and relief. This theory was chosen because it explains the pleasantness of emotions in a rational and direct way. However, a limitation of the theory is that it looks at pleasantness just from the perspective of goal satisfaction neglecting other sources that may contribute to its different shades. We rely now upon previous research in the field of pleasure and product design to attempt to explain the various shades of pleasure.

In product design, pleasure has been linked to physical (e.g. enjoying food),

ideological (e.g. reading a novel), social (e.g. being with friends), and psychological (e.g. solving a puzzle) aspects (Jordan, 2000). Some of the emotions from the set may be more pleasant than others because they are linked to the fulfilment of different types of pleasure among those suggested above. For example, experiencing inspiration may help enhance ideological pleasure, whereas satisfaction may help enhance psychological pleasure. However, the matter is more complex than this as well-being, agency of pleasure and context have also been argued to influence the shades of pleasure.

There are some emotions in fact that are more pleasant than others because they stimulate well-being. For example previous research on emotions has identified that joy or pride stimulate well-being (Ellsworth and Smith, 1988; Fredrickson, 2003). As we have reported in *Chapter 2* there are at least two types of well-being, namely hedonism and eudaimonic (Ryan and Deci, 2001). Considering that hedonism relates well-being to pleasure in general, it seems that it aligns well with any of the four types suggested by Jordan. Eudaimonic consists of more than just pleasure or happiness, as it suggests that well-being lies in the actualisation of human potentials (Ryan and Deci, 2001). It could be argued that eudaimonic shares some similarities with the ideological pleasure suggested by Jordan, e.g. reading allows humans to reach their human potential. However, the actualisation of human potentials rely upon a set of actions or activities as a whole, not on the result of a single activity.

The agency of pleasure can also explain the differences between emotions, i.e. those assigned to the self may be more pleasant than those triggered by external agents. For example, in the study in *Chapter 2* we identified two experiences with great products, i.e. pragmatic and significant. These experiences differed in their level of pleasure; in particular the activities and the people involved, the needs fulfilled, the emotions elicited, and the product attributes were all aspects that impacted on the pleasure that people gained with great products (Ortíz Nicolás 2013a). A key aspect of pragmatic and significant experiences, however, was the focus on the product, and on the user respectively. The latter indicates that solutions that shift from products to people seem to be experienced more pleasantly.

Finally, it is also necessary to acknowledge that the pleasure gained through products may never be the same as the one gained through human-human interactions. The joy of solving a problem is not the same as the joy of requited love. The

frustration caused by an unresponsive partner is not the same as the frustration caused by an unresponsive computer (McCarthy and Wright, 2004). Emotions do not exist independent of the particular circumstances in which the human-product interaction occurs. Therefore, the differences in pleasantness identified in this study may also be the result of specific context-related situations, e.g. the impact that other people have on the experience, or the physical conditions in which the situation develops (Forlizzi, 2007; Ortíz Nicolás, and Aurisicchio, 2011).

Infrequently experienced emotions

Some participants to this study reported that they did not experience some emotions with products, i.e. worship, sympathy, lust, love, kindness, and respect. These were reported by one third of the participants. It is interesting to note that the least preferred and infrequently emotions that we identified in our previous study are worship, sympathy and lust (see *section 3.2.1* in *Chapter 3*). There are at least two reasons that can explain this. First, the emotions may be difficult to experience with products, e.g. lust and worship. Second, the emotions may depend on personal values, e.g. users may believe that is correct or not to love or worship products. More research is needed to understand if it is worth keeping these emotions in the set studied in this project.

Typology of experiences

If in *Chapter 2* we distinguished pleasant experiences into pragmatic and significant and investigated the emotions linked to these experiences. The research presented in this Chapter can be seen as characterising pleasant experiences starting from the emotions and their pleasantness and arousal dimension. Studying just the pleasantness and arousal of emotions has limitations. As an example it was not sufficient to capture particular characteristics of emotions that are similar in the studied dimensions, e.g. relax and relief are both very pleasant and calm (Ekman, 1999). Thus, understanding the differences between relaxation and relief cannot be achieved through pleasantness and arousal only.

Design implications

The results of this research suggest that emotions can be used to categorise pleasant experiences, and that a basic strategy to enhance experiences is to target the design of these emotions. It is expected that the emotions selected by a designer to be triggered through a designed product will impact on the decisions to configure the new solution. Another aspect to consider when aiming to enhance any of these experiences is the context in which the product is going to be used, e.g. calm experiences may fit better in the context of a hospital and exciting ones in that of an amusement park.

Limitations and further work

The results of this study can be considered a first step towards understanding the differences between positive emotions in relation to the two explored dimensions in the context of durable products. Even though this study used collages to diminish the biases of recalling emotions we acknowledge that it is not the same as experiencing them. Future research can reduce recall bias by using a set of products that users can see and interact with. Previous scholars have suggested that defining a product sample to study emotions is an alternative to reduce the recall bias and gain immediate emotional responses (e.g. Hassenzahl, 2004; Ortíz Nicolás, and Hernández López, 2008). In addition, future research can study emotions on an ecological context, i.e. in real life situations. However, considering the complexity and richness of the data that qualitative research delivers, this may restrict the number of emotions to be studied. For example, studying the whole set with interviews would demand several human resources. Another line of inquiry is to study some emotions in depth to identify finer differences among them, e.g. relaxed and relief. To date, it is known that these two emotions are calm and very pleasant. It is, however, unclear what other aspects are involved when experiencing these emotions, e.g. agency. Understanding these finer differences may help designers to intentionally design pleasant and calm experiences. Another limitation of this study is that it relied on the participant's knowledge and understanding of the twenty five emotions. Future studies can rely on emotion names and their descriptions to make sure that participants assign the same meaning to the emotions.

4.5 *Conclusions*

This chapter has presented research to investigate a set of twenty-five positive emotions from the perspective of two dimensions of emotions, i.e. pleasantness and arousal. With this research pleasant experiences were further deconstructed to better understand them. The main contribution of this research to the field of user experience is the characterisation of the twenty-five positive emotions in relation to two basic dimensions of emotions.

We identified three level of pleasantness, namely *pleasant*, *mildly pleasant* and *very pleasant*. This result indicates the limitation of using pleasure as an umbrella term. Three levels of arousal were also identified, namely *exciting*, *median* and *calm*. At this stage, the knowledge developed through this study can be used by designers to inform the selection of some emotions over others when they aim to control the level of pleasantness and arousal of an experience in the specific context of a design brief. It can also be used to select emotions when developing tools to measure the emotions elicited by products as well as to organise emotions based on their objective dimensions in comparison to assigned characteristics as in the case of *Chapter 3*, i.e. frequency, preference and difficulty of elicitation of the twenty-five positive emotions.

The methodological approach used in this study was useful to study the pleasantness and arousal of twenty-five positive emotions. Based on its results we conclude that a pleasant-very pleasant and exciting-calm scale is not sufficient to capture the differences among emotions. To gain deeper knowledge of the subtleties and nuances of the emotions, qualitative research methods can be an alternative. Investigating other qualities and dimensions of emotions, such as behavioural reactions and agency, is important to create more detailed profiles.

Chapter 05

Investigating four Positive Emotions Elicited by Human-Product Interactions

* * *

Research in user experience aims, among others, to understand the pleasant experiences resulting from interaction with products. Pleasant experiences with products may trigger positive emotions such as fascination, confidence, or satisfaction. Therefore, a way to understand the goodness of those experiences is to focus on the positive emotions involved. Emotions are a central aspect of user experience and they imply a clear link between the person experiencing them and the object that triggers the emotions. For example, an individual can be afraid of something, proud of something, in love with someone, and so on (Frijda, 1986). Scherer (2005) explains this characteristic of emotions as the event focus feature. Emotions are somehow connected to or anchored in specific events, external or internal to individuals, rather than being free-floating. Scherer explains that the 'anchor' results from a strategic and intentional decision, or exists as a permanent feature of an individual as in the case of a personality trait. In other words, whatever *triggers* a specific emotion can actually be identified.

Focusing on positive emotions to understand pleasant experiences is appropriate because they are central to the human nature, contribute richly to the quality of life (Diener & Larsen, 1993), improve well-being (Ortony et al, 1988; Fredrickson, 2003) and colour experience (Hassenzahl, 2010; McCarthy and Wright, 2004). These reasons explain why scholars from the field of psychology have stressed the importance of carrying out studies on positive emotions. These are needed to guide applications and interventions that might improve individual and collective functioning, psychological well-being, and physical health (Fredrickson, 2003). A challenging aspect of studying them, however, is that they are more difficult to differentiate (Fredrickson, 1998) than negative emotions. Another one is that emo-

tions are a phenomenon of many components or structures (Fridja, 1986; Fridja et al, 1989; Fredrickson 2003; Scherer, 2005). For example, one of these structures is agency, which is related to who or what triggers an emotion. Considering the multiple components involved in experiencing emotions is, therefore, important to form rich descriptions (Fridja et al, 1989).

As it happens in psychology, within product design positive emotions are not well studied. Previous research on products and positive emotions has shown that products that evoke them are bought and used more often, are more pleasurable to use, and consumers trust them (Desmet, 2012; Ortiz Nicolas et al, 2013). Furthermore, it is known that designers have little knowledge about positive emotions (Desmet, 2012) and when trying to design for emotions they rely on 'quick and dirty' approaches (Porter et al, 2008; Chhibber et al, 2004), as well as on self-referential ones such as experimentation and defining a solid concept (Ortiz Nicolas et al, 2013). Gaining knowledge about positive emotions can improve the practice of design when aiming to design for pleasant experiences. The aim of this study is to characterise in detail four positive emotions resulting from human-product interaction with the objective to identify their triggers, appraisal structures, thought-action tendencies, and suggest appraisal themes. With this knowledge a plausible description of them will be obtained. The specific emotions studied are anticipation, confidence, inspiration, and sympathy. In the following section the reasons to select these four positive emotions are explained in detail.

Selection of the four positive emotions

In the field of product design Desmet (2012) identified 25 positive emotions that are triggered as a result of human-product interaction. However, these emotions were not studied in terms of their multi-componential characteristics, which are fundamental to create plausible descriptions of each emotion (Frijda, 1986; Ellsworth and Smith, 1988; Scherer, 2005). Four emotions were chosen from the set identified by Desmet (2012) to be further investigated. The reason to focus on four emotions is based on the need to have a variety of emotions upon which undertaking in-depth research without compromising the quality of the data. In this case, four emotions were found to be a reasonable number to study and manageable by the researcher. The selected emotions are presented in *Table 5.1* along with their definition.

Emotion	Definition
Anticipation	To eagerly await an anticipated desirable event that is expected to happen
Confidence	To experience mental or moral strength to withstand or cope with the situation
Inspiration	To experience a sudden and overwhelming feeling of creative impulse
Sympathy	To experience an urge to identify with someone's feeling of misfortune or distress

Table 5.1. *The four emotions studied with their definition (Desmet, 2012)*

The selection of the emotion set to be studied was not easy. The emotion set had to satisfy the following criteria:

- Variation in the frequency of experience. For example inspiration is less frequent than confidence (Desmet, 2012; Ortíz Nicolás et al, 2013).
- Variation in the temporal expectancy. For example, anticipation seems to be related to a future event that is likely to take place (Lazarus, 1991) and thus is linked to a period of time, which goes from anticipating to the actual manifestation of the event happening. Confidence, on the other hand, seems to be immediate and if there is a future expectancy, it is not as long as in the case of anticipation.
- Variation in suitability to be triggered by products. For example, sympathy is infrequently experienced in human-product interactions in comparison with the other three emotions (Desmet, 2012; Ortíz Nicolás et al, 2013). Sympathy may represent an opportunity for increasing the range of emotions to design for.
- Variation in arousal and pleasantness (See also Fredrickson, 1998). For example, inspiration is very pleasant and exciting. Confidence is also very pleasant and median in terms of arousal. Anticipation is pleasant and median in terms of arousal. Sympathy is the least pleasant of the four emotions and is calm (see *Chapter 4*).
- Availability of existing knowledge. There is little knowledge about positive emotions resulting from human-product interactions in general and about

these four in particular.

- Opportunity to use the knowledge to be developed across cultures. For example, confidence and inspiration were also identified in previous research on products and emotions carried out in a non-European study (Ortíz Nicolás and Hernández López, 2008). As such, the knowledge to be developed is suitable for use in other regions of the world (See also Ekman, 1992).

5.1 *Introduction to appraisal theory*

This research aligns with appraisal theory, which in its simplest form claims that emotions are elicited by evaluations (appraisals) of events and situations. As a result, all situations to which the same appraisal pattern is assigned will evoke the same emotion (Roseman and Smith 2001). It has to be considered that an infinite number of situations that are similarly appraised will evoke the same emotion, including situations that have never been encounter before (Roseman and Smith, 2001: p 7).

The three key constructs employed in this research to investigate positive emotions are introduced in *Figure 5.1*, namely appraisal themes, appraisal structures and thought-action tendencies.

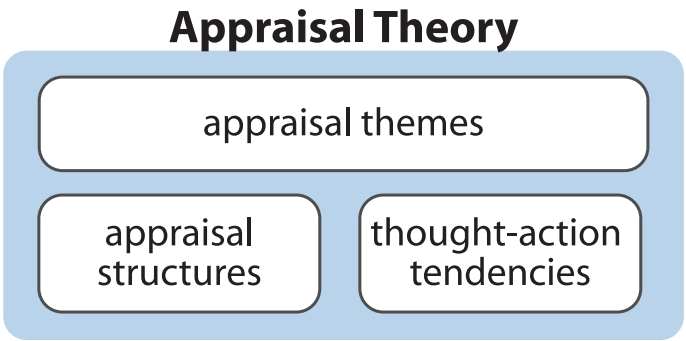


Figure 5.1. *Main constructs of appraisal theory*

Appraisal themes

These are summary appraisal statements that reflect the overall personal relational meaning evoked by an emotion (Demir et al, 2009). For example, the loss of one's first love or the first cherished possession are likely to elicit sadness (Roseman and Smith, 2001). Similarly, the death of a relative may trigger the same emotion in most humans. Appraisal themes aim to provide a general idea of the triggers of the emotion.

Appraisal structures

Appraisal structures have been defined as assumptions on the way individuals perceive the world, and how this perception leads to the activation of emotions (Martinho, Machado, Paiva, 2000). They characterise internal or external aspects of an individual experiencing an emotion (Scherer, 2005). For example, controllability as an appraisal structure aims to establish if a person has or not the power to influence or direct a situation when experiencing an emotion. Eight appraisal structures consistently used when studying emotions in the field of appraisal theory (Ellsworth and Smith, 1988; Frijda, Kuipers, and ter Schure, 1989; and Scherer, 2005) and product design (Demir et al, 2009) were selected for this research. *Table 5.2* presents each structure with a description. As it can be seen each description has a variable, which can have two or more values. *Table 5.2* lists the values for each variable and codes to identify them, which will be used in *section 5.3* to present the results.

Appraisal Structure	Description	Values and codes for variable
Motivation	The situation was consistent (or inconsistent) with what I wanted	CO: COnsistent IC: InConsistent
Expectedness	It was an expected (or unexpected) situation	EX: EXpected UX: UneXpected
Agency	I was (other people, or the circumstances were) responsible to elicit the emotion	ON: ONeself (the experiencer) OP: Other People CI: Circumstances
Self-esteem	Experiencing the emotion increase (or does not increase) my self-esteem	DI: Does Increase self-esteem
		DNI: Does Not Increase self-esteem
Controllability	I had (or did not have) the power to influence or direct the situation	PP: People have Power over the situation
Predictability	I knew (or did not know) what was going to happen next	PR: PRedictable UP: UnPredictable
Effort	It requires mental (or physical or no) effort	ME: Mental Effort PE: Physical Effort NE: No Effort
Coping potential	I have enough skills and/or knowledge to handle the situation	LCP: Low Coping Potential HCP: High Coping Potential

Table 5.2. *Appraisal structures*

Motivation helps identify if there is motivation-consistency. For example, motivation-consistency can be monitored from the progress in the attainment of a goal. Expectancy explores if under the given circumstances the experience of the emotion was expected or unexpected. For example, surprise is usually elicited when an unexpected event happens (Ludden, 2008; Desmet, 2012). Agency characterises who or what is 'responsible' to elicit the emotion, i.e. the self, other people, or the circumstances (events, activities or products). Self-esteem explores if experiencing an emotion affects the user' self-esteem. Controllability describes if the user believes to be able to influence the situation. Predictability defines if the user has an idea of what is going to happen next. Effort is related to mental or physical effort involved when experiencing the emotion. Finally, coping potential explores if the situation represents a challenge for the user and as a result skills are needed to handle it.

Appraisal theorists have mainly focused on the eliciting conditions of basic emotions, e.g. joy, pride, and surprise (Fredrickson, 1998). Therefore, it has been difficult to find theoretical information about the appraisal structures for the four emotions selected in this study in relation to human-product interactions. The appraisal structures identified are presented next:

Anticipation

- Situational certainty is involved; what is happening around the person is certain and clear (Lazarus, 1991).
- Positive future expectancy is involved; the person expects a desirable event that is likely to take place (Lazarus, 1991).

Confidence

- Consistent motivation is involved; the situation is important for the person due the progress of goal attainment or one's well-being (Ellsworth and Smith, 1988).
- Self-agency is attributed; the person is the agent responsible for eliciting the emotion (Ellsworth and Smith, 1988).
- Predictability is involved; the person knows what is going to happen or how the event is going to develop (Ellsworth and Smith, 1988).
- Coping potential is involved; the situation includes something that is perceived as an obstacle standing in the path between oneself and getting what the person wants (Ellsworth and Smith, 1988).

Inspiration

- Positive future expectancy is involved (Desmet, 2008).

Sympathy:

- Consistent motivation is involved; the event or its outcome is highly relevant for the self, or their social reference group (Lazarus, 1991).

Thought-action tendencies

Thought-action tendencies characterise behavioural and cognitive aspects of the individual experiencing an emotion (Fredrickson, 1998). Fredrickson argues that it is more difficult to observe action or behaviour in positive emotions compared to negative ones. For example, when experiencing fear it can be observed if people have an urge to flee (Frijda, 1986). On the other hand, when experiencing relaxation it is difficult to observe if they experience deep thinking.

Thought-action tendencies are important to identify because they establish, maintain or modify the relationship between the individual and the object of their emotion (Desmet, 2008). For example, it has been suggested that positive emotions stimulate individuals to accept objects with a resulting tendency to approach them (Frijda, 1986; Frijda et. al, 1989). To select the tendencies for this study, we started from a compilation of twelve thought-action tendencies that Desmet (2008) assembled based on the research of Frijda (1986) and Frijda et al (1989). The aim of developing this compilation was to exemplify the relevance of thought-action tendencies when studying emotions instead of testing and confirming the tendencies per emotion. The eight action tendencies that we selected from Desmet's compilation are those that are more appropriate for human-product interactions, e.g. *approach* instead of *be with.* The appropriateness of the action tendencies was judged based on our expertise in product design and user experience. Additionally, we included three tendencies related to engaging activities with products, e.g. *pay attention*, *obtain*, and *get hands on*. Finally, we added four tendencies that seem appropriate to at least one of the emotions, e.g. *eager for* for anticipation; *reassure* for confidence; *create* for inspiration; and *reflect on* for sympathy. *Table 5.3* presents the set of fifteen thought-action tendencies and their description.

Name	Description
Approach*	Come close to, move towards, or draw near
Accept*	Tolerate, receive, agree with
Care for*	Be tender, help, comfort
Create	Originate, cause, invest
Eager for	Await, expectant
Get hands on	Grab, engage with, physical interaction
Identify with*	Participate, lose distance, or fuse with
Maintain*	Cause to continue in a specified condition, keep
Obtain	Get, possess, acquire
Open up*	Be receptive or be approachable
Pay attention	Take notice of someone or something
Reassure	Certainty, dispel doubts
Reflect on	Think deeply or carefully about
Savour*	Relish, take in and experience
Surrender*	Give in, or part with

Table 5.3. *Thought-Action tendencies (*selected from Desmet's compilation)*

The thought-action tendencies identified in the literature for the emotions studied in this research are presented next:

Confidence:

- A tendency towards being free from doubt, which was synthesised in the concept of reassurance (Desmet, 2012).

Inspiration:

- A push tendency for which the person is in a heightened state of awareness or pays attention towards some new (or rediscovered) thought or action (Desmet, 2008).
- The stimulation of creative thought or activity as a result of being inspired (Desmet, 2012).

5.2 *Understanding four positive emotions*

This section presents the process followed to carry out this study including the research approach, the participants, the material, and the procedure.

5.2.1 *Research approach*

One of the challenges of studying positive emotions is finding suitable conditions for investigating them. A crucial problem is to identify the moment in which a person will experience certain emotions as part of real situations. This is rather complicated and as a result we decided to use an artificial environment. A second challenge is to gain access to immediate experiences. It has been mentioned that most of what we know about subjective experience comes from questionnaires filled out by respondents who are trying to remember what it feels like experiencing an emotion rather than experiencing it in real time (Ekman 1999; Hektner and colleagues, 2007). Considering that studying emotions through recall has limitations we decided to employ a study involving a traditional activity based on recall and an activity based on direct experience. In activity A, participants were asked to select a product that they were using and had previously triggered an emotion assigned to them, see *Figure 5.2*. In activity B, participants were asked to rank a set of eight preselected products based on a second emotion, see *Figure 5.2*. Hence, activity A was designed to give access to remembered experiences through two products owned by the participants, and activity B to immediate experiences through eight preselected products which participants were not familiar with. These activities are explained in detail in the procedure section.

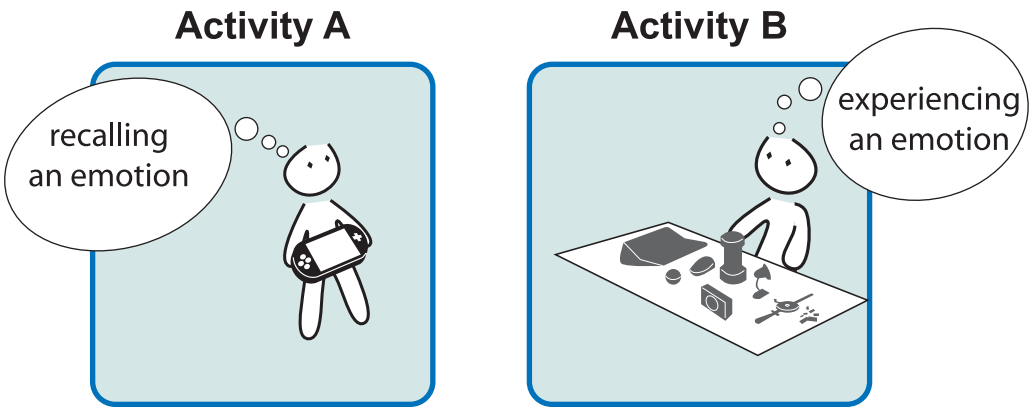


Figure 5.2. *Recalling and experiencing emotions*

To gain deep understanding of the emotions, we relied on semi-structured interviews and written reports. The interviews were used to discuss in-depth what triggered the emotion. Written reports were used, instead, before undertaking activity A to capture information about the context in which a user experienced an emotion. This pre-activity also stimulated participants' reflections on the emotion, which were later discussed in the interview.

5.2.2 *Participants*

The respondents to this study were thirty-two (nineteen females and thirteen males). The set-up of this study was defined to gather sixteen respondents per emotion. This number allowed us to undertake in-depth research without compromising the quality of the data. Participants were from various nationalities (British, French, Chinese, Mexican, and South African). Most of them had a background in Engineering (Mechanical, Aeronautical, Biomechanical, and Biochemical). They were between 19 and 39 years old (M=26.2; SD=4.4). Almost all participants were students at Imperial College London (IC) at a postgraduate level. Three of them were professionals. Participants had no relation to the activity of product design and had a good command of English language, including six participants who were English native speakers.

5.2.3 *Material*

The material used in this study includes cards of appraisal structures, cards of thought-action tendencies and eight preselected products.

Printed cards were used because through a pilot study it was found that they would make easier for both the interviewer and the participants to discuss appraisal structures and thought-action tendencies. For example, it was found to be difficult to ask participants whether the situation within which they experienced an emotion increased their self-esteem. On the other hand, it was found to be easy ask participants to pick-up a card, while showing the options for the appraisals, i.e. it increase or it does not increase my self-esteem. Participants chose the appropriate appraisal for the emotion and explained their reason. The latter, however, does not apply for coping potential, which was investigated during the interview, asking how challenging the situation or product were when experiencing the emotions.

The appraisal structures presented in *Table 5.2* were printed out on white cards (3x19 cm) with their descriptions. For example, in the case of motivation two cards were printed as follows: '*The situation was consistent with what I wanted*' and '*The situation was inconsistent with what I wanted*'. For agency and effort three cards were printed out as these appraisal structures consisted of three options.

The thought action tendencies in *Table 5.3* were printed out on white cards (3x9.5 cm) with their descriptions.

Eight preselected products were used in Activity B, see *Figure 5.3*. From top left to bottom right these are: a wind-up lamp, a speaker, a mini-lamp, Lego bricks, a water proof camera, a chopping board, a hand drill and a mouse. Three criteria were defined to select the eight products:

- To include products from different categories, e.g. kitchen and office appliances, tools, and outdoor products. Using a broad range of products to explore aspects of user experience and avoid recall biases has been suggested as a valuable approach by previous researchers (Hassenzahl, 2004; Ortíz Nicolás and Hernández López, 2008);
- To include products that many people can afford. To achieve this criterion a price range was established. Products should have a cost between 5 and 30 UKP.
- To include products with different levels of interactions, e.g. the win-up lamp involves high levels of interaction in comparison to the mouse.



Figure 5.3. *Eight products used in Activity B of this research*

5.2.4 *Procedure*

The details of the procedure adopted in this study are shown in *Figure 5.4*. As discussed earlier the study consisted of activity A and activity B.

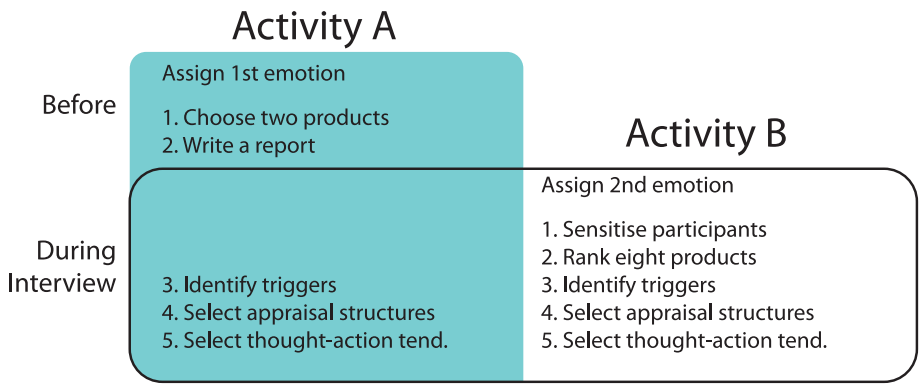


Figure 5.4. *Structure of the session*

Thirty-two interviews lasting approximately 60 min each were carried out. During the interviews each participant was asked to complete activity A and activity B as described below. The emotions were assigned based on order of attendance and a predefined list of pairs.

Activity A

Following the assignment of the first emotion, activity A consisted of five steps of which two took place prior to the interview and three during the interview itself. First, the participants were asked to choose two durable products that triggered the assigned emotion. Durable product were defined to them as manufactured items that are expected to have a relatively long useful life, e.g. a bike, kettle, digital camera. Second, the participants were asked to generate a written report of their experience of the emotion considering its intensity, the eliciting conditions, and whether experiencing the emotion was an expected or unexpected event. They also reported the last time that they experienced the emotion with the chosen products. Third, the participants attended to the interview, which was designed to identify how the products triggered the emotion (appraisal). We asked them why the products that they selected triggered the emotion, and whether some product attributes influenced them in experiencing it, e.g. novelty, meaning, appearance, and functionality. See Appendix 6 for the questions asked during the interview. Fourth, the participants were invited to recall the last time that they had experienced the emotion with one of the products. Following this, cards with the appraisal structures were shown to them, see Table 5.2. At this point, the participants chose the appraisal structures that were judged appropriate for the studied emotion. Fifth, the participants received a set of fifteen cards in which the thought-action tendencies were printed out, see Table 5.3. At this point, they chose the tendencies that reflected their behaviour and thoughts when experiencing the emotion.

Activity B

Following the assignment of the second emotion, activity B consisted of five steps.

First, the participants received an A4 sheet with four images printed in colour related to the assigned emotion. These images were defined by Yoon and colleagues (2013). Through the use of the images participants were sensitised about the emotion.

Second, the participants were introduced to eight pre-selected products and were asked to rank them, from the ones that triggered the emotion the most to those that triggered it the least, see *Figure 5.5*. Third, the participants were interviewed to identify how the products triggered the emotion (appraisal). See *Appendix 7* for the questions asked during this interview. Fourth, the participants selected the appraisal structures relying on their product ranking, see *Table 5.3*. Fifth, the participants received a set of fifteen cards with the thought-action tendencies and chose those that reflected their behaviour and thoughts when experiencing the emotion.



Figure 5.5. *The ranking of products in Activity B*

5.2.5 *Data analysis*

Each of the thirty-two interviews produced data about two emotions. The data gathered during an interview for one emotion is referred to as a data point. Hence, each interview enabled the collection of two data points about different emotions. In total we gathered sixteen data points per emotion of which eight were collected from activity A and eight from activity B, see *Figure 5.6*.

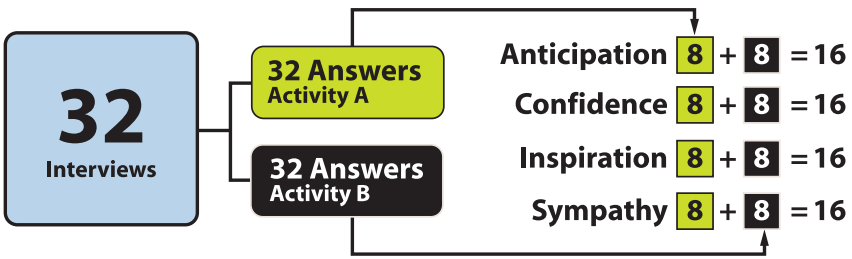


Figure 5.6. *Thirty-two datasets from the study*

To analyse the data we followed the approach presented in *Figure 5.7* based on the suggestion of Ryan and Bernard (2003).

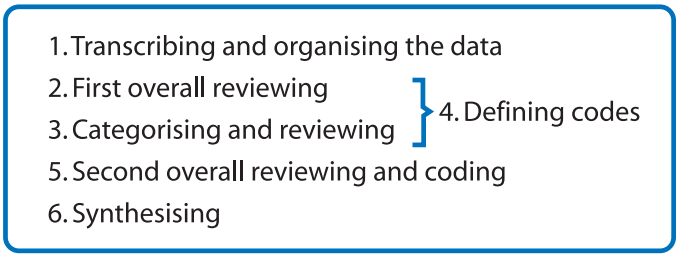


Figure 5.7. *Process to analyse the data*

First, all the interviews were transcribed and the data organised. This included producing digital copies of the reports collected during activity A. Second, the data was analysed to become familiar with it. Third, the transcripts from the interviews were segmented based on whether they focused on the triggers, appraisal structure

or thought action tendencies, and grouped per emotion and activity type. As an example, for activity A the segments related to the triggers were the reports and the early part of the interviews in which participants explained why the product elicited the emotion. Differently, for activity B the segments related to the triggers were those in which participants explained the ranking of the products that triggered the assigned emotion. Fourth, the segments were coded. Three examples of coding are shown in *Table 5.4*. The *Trigger* code shows a fragment of text that was coded as such because it explains why inspiration was elicited by the chopping board (product). It is noteworthy that the term trigger is also referred to in the literature as source (Desmet, 2012). A trigger was further categorised based on the six types suggested in the literature, i.e. products, meaning, interaction, activity, self, and other (Desmet, 2012). The *Theme* code shows a fragment of text that was coded as such because it explains the understanding of anticipation by a participant. The *Coping potential* code shows a fragment of text that was coded as such because it explains the challenge faced by a participant. Fifth, the transcripts and the selected sections were reviewed and further coded. Sixth, the results emerging from the study were synthesised.

Code	Example
Trigger	*'The chopping board because I love cooking and cooking requires a lot of imagination and creativity. If you are not following a récipe, you have to invent.'*
Theme	*'There are two sides of anticipation: the side where I project myself in the future and I can see what is going to happen before it actually happens. The other side is all about the excitement/pleasure, associated with the activity you do with the product, mainly with products that I see every day and that reminds about pleasant situations or context in the future when I will use this product again'*
Coping potential	*'Anyone can use a pencil or a pen but to what extent? When I see this pencil and a blank piece of paper, I think about creativity and scribbling things and not everyone might have these tendencies.'*

Table 5.4. *Coding examples*

5.3 *Results*

The results are presented per emotion focusing initially on the triggers, appraisal structures, and thought-action tendencies, and subsequently on the appraisal themes. By following this structure we aim to show how the appraisals themes were extracted from the data, see *Figure 5.8*.

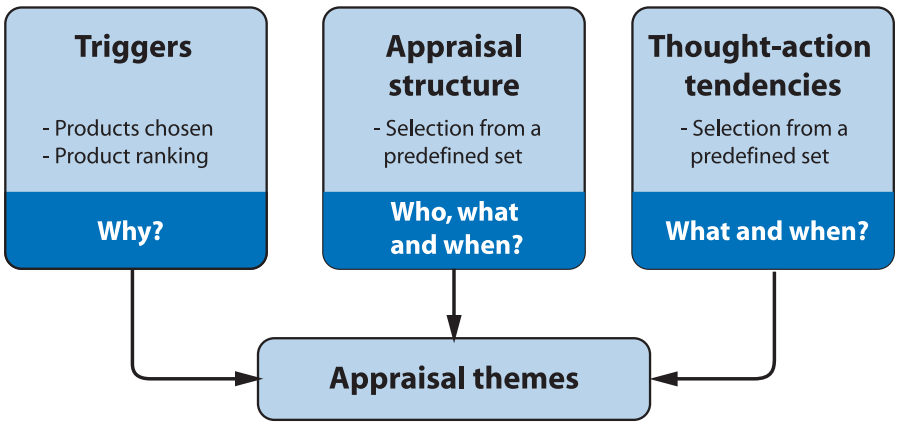


Figure 5.8. *Process to synthesise the appraisal themes*

5.3.1 *Anticipation*

This section presents the findings for anticipation.

Triggers of anticipation

For activity A, participants chose the following products as triggers of anticipation: digital camera (4), TV (2), laptop (2), mobile phone (2), bicycle lights (1), backpack (1), robot cleaner (1), coffee machine (1), and bicycle (1).

For activity B, the products that mostly triggered anticipation were the disposable water camera (ranked in the top two places by five participants out of eight) and the chopping board (ranked in the top two places by four participants out of eight).

Data analysis showed that anticipation is triggered when:

The user has to experience a novel *product*, e.g. the product has a new and unknown feature that the user is eager to try out.

The user foresees pleasure in performing an *activity*, e.g. watching TV.

The user foresees a benefit that a *product* will bring to his or her life, e.g. a robot cleaner that will help doing activities that are generally seen as unpleasant and boring.

A positive future *event* is going to happen soon, e.g. going on holiday.

These four triggers were identified from activity A and the first three were also confirmed from the results of activity B.

From activity B, it was possible to identify also the inhibitors of anticipation. Participants do not experience anticipation when products are not useful or relevant to their daily life. An example of this is the hand drill (ranked in the last two positions by six participants out of eight). More so, participants do not experience anticipation when they are familiar with a product and they know what is involved in using it. An example of this is the Lego bricks (ranked in the last three positions by five participants out of eight).

Appraisal structures of anticipation

The appraisal structures that are involved in experiencing anticipation are presented in *Table 5.5*. To explain how to read *Table 5.5* the example of the appraisal structure *motivation* is now considered. For this appraisal structure the column 'description' presents the overall result, which indicates that, when experiencing anticipation, the situation is *consistent* with the goals of the experiencer. The values in the columns 'activity A' and 'activity B', instead, indicate that seven out of the eight participants to activity A found that the situation upon which they experienced anticipation was consistent with their goals, and all the participants to activity B shared this view. Hence, this result shows agreement between participants to an activity and across activities.

Appr. Structures	Example	Result		
		Description	Activity A	Activity B
Motivation	*I achieved the goals I tried to achieve*	The situation is *consistent* with the person's goals	CO: 7	CO: 8
Expectedness	*You cannot anticipate something unexpected*	It is an *expected* event	EX: 6	EX: 7
Agency	*It is usually the circumstances and myself who triggered it*	It is triggered by an external factor assigned to *the circumstances* (events, activities or products)	CI: 8	CI: 5
Self-esteem	*It does not influence my self-esteem*	It *does not* increase self-esteem	DNI: 4	DNI: 5
Controllability	*I have the power, otherwise I would buy everything*	*The person has the power* over the situation	PP: 7	PP: 6
Predictability	*The point of anticipating is to predict what is going to happen next*	*Predictable*, the person has an idea of what is going to happen next	PR: 5	PR: 7
Effort	*I need to think about the product*	Usually requires *mental effort*	ME: 6	ME: 5
Coping potential	*It is not about high skills because the products are practical and easy to use*	*Coping potential is low*, products are easy to use	LCP: 7	LCP: 4

CO (COnsistent); EX (EXpected); CI (CIrcumstances); DNI (Does Not Increase self-esteem); PP (Person has the Power); PR (PRedictable); ME (Mental Effort); LCP (Low Coping Potential

Table 5.5. *Appraisal structures of anticipation* (total participants per activity=8)

Overall, the results indicate that to experience anticipation there has to be motivation consistency. Anticipation is an emotion that is expected and it is triggered either by an external factor assigned to the circumstances (events, activities or products). The experiencer is part of those circumstances and the external factor is of interest. For self-esteem it was not possible to identify a clear pattern (note that four out of the eight participants to activity A and five out of the eight participants

to activity B indicated that anticipation increases self-esteem). When experiencing anticipation, it seems that the experiencer has the power to influence or direct the situation. More so, in line with the concept of situational certainty proposed by Lazarus (1991), the experiencer seems to know what is going to happen next. The emotion requires mental effort and typically there is low coping potential involved. The situation within which anticipation is experienced is not challenging, and as a result the experiencer does not strongly rely on his or her skills to deal with it.

In addition, anticipation includes a temporal aspect, which is related to the future, i.e. looking forward to using a product or performing a pleasant activity. This is in line with Lazarus (1991) who suggests that when experiencing it there is a positive future expectancy. Usually, participants are aware of their anticipation and the emotion generally lasts until the person obtains the product and it may include the first days of use. When anticipation is triggered by activities or events is expected to be experienced each time that a similar activity or event is going to happen.

Thought-action tendencies for anticipation

Four tendencies were identified in relation to anticipation. These are now presented indicating in brackets the number of participants who chose it for activity A and activity B respectively.

When experiencing anticipation users are *eager for* (6; 6) an event about to happen. They also reported that they want *to obtain* (6; 4) the product or live the event that triggers the emotion. To a less degree they *pay attention* (5; 4) to the product or event that that triggers anticipation. These action tendencies were consistent in both activities. However, in activity A participants also reported that they want to *get their hands on* (6; 3) the product that triggers anticipation. This can be explained because participants from activity A brought products that they already 'owned' and 'got their hands on', whereas in activity B participants were confronted with a set of products that triggered anticipation for a short period of time. This 'controlled' anticipation may have not been enough to let participants get excited and get their hands on the product.

Appraisal themes for anticipation

As explained in *Figure 5.8*, the appraisal themes were synthesised from the triggers, the appraisal structures, and thought-action tendencies.

Anticipation is experienced when a person is certain to gain pleasure from a product, an activity, or an event. It is related to the system of pleasant activities and events linked to the product. Many products that were chosen by participants can support this argument. As an example the backpack that is used during future and pleasant events such as holidays.

Anticipation also arises when a person is certain that a product will deliver a new pleasant experience. This positive experience may be the result of a novel attribute of the product. Novelty seems to place a significant role for anticipating products, especially when it is expected to be good and has not been experienced before. This also explains why when users are anticipating a product or an activity there is a strong wish to use such product or to perform that activity.

5.3.2 *Confidence*

This section presents the findings for confidence.

Triggers of confidence

For activity A, participants chose the following products as triggers of confidence: mobile phones (3), shoes (3), laptop (1), calculator (1), electric toothbrush (1), scooter (1), pencil (1), bag (1), perfume (1), and shaver (1).

For activity B, the products that triggered confidence were: the wind-up lamp (ranked in the top three places by five participants), the chopping board and the disposable water camera (both ranked in the top three positions by four participants).

Data analysis showed that confidence is triggered when:

- A *product* delivers good functionality, e.g. a calculator is a 'reliable' product
- The *user* has dealt with a difficult situation with the help of a product, e.g. a scooter was a mean for a user to deal successfully with a challenging situation.
- The *user* improves his or her skills with the help of a product, e.g. becoming a better drawer with the help of a pen.
- The *user* reflects aspects of his or her identify such as a personality trait

with the help of a product, e.g. I feel confident when I wear my heels.

- The user knows how to use a *product* due familiar *interaction* and function, e.g. a waterproof camera relies upon a familiar interaction. On the opposite, novelty seems to diminish user's confidence, possibly because novel things are unknown.
- The *user* is in control of the situation, e.g. the wind-up lamp gives access to light regardless of the situation in which one is in and therefore in control of the situation.
- The user feels consistency with the *product* appearance and *interaction*, e.g. a chopping board that feels and looks robust, of good quality, and easy to use.

The first five triggers were identified from activity A and the last three triggers were identified from activity B.

From activity B, it was possible to identify also the inhibitors of confidence. Participants do not experience confidence when they do not know what the outcome is going to be. An example of this is the Lego bricks (ranked in the last position by three participants out of eight). More so, participants do not feel confidence when the products feel fragile and cheap. An example of this is the mini-lamp, which gave the impression that it was going to fail soon after its purchase.

Appraisal structures for confidence

The appraisal structures that are involved in experiencing confidence are presented in *Table 5.6*. To explain how to read *Table 5.6* the example of the appraisal structure *expectedness* is now considered. For this appraisal structure the column 'description' presents the overall result, which indicates that, when experiencing confidence, the situation is *expected*. The values in the columns 'activity A' and 'activity B', instead, indicate that all the participants to activity A found that experiencing confidence is an expected event and seven out of eight participants to activity B shared this view. Hence, this result shows agreement between participants to an activity and across activities.

Appr. Structures	Example	Result		
		Description	Activity A	Activity B
Motivation	*Yes, the intention was to look good*	The situation is *consistent* with what the person wants	CO: 8	CO: 8
Expectedness	*It is expected because you know before what you can do with the product*	It is definitely *an expected event*	EX: 8	EX: 7
Agency	*It comes from myself, but it is also linked to other people, what they see*	It is triggered by *oneself*	ON: 7	ON: 8
Self-esteem	*I do not think self-esteem is related to it*	It *increases* person's self esteem	DI: 4	DI: 8
Controllability	*I feel that I can make it, I feel strong, powerful*	*The person has the power* over the situation	PP: 8	PP: 7
Predictability	*Most of the times you know what is going to happen next*	*Predictable,* the person usually has an idea of what is going to happen next	PR: 5	PR: 6
Effort	*When feeling confident you do not need any effort*	It may require some *mental effort*, but it comes also with *no effort*	ME: 4; NE: 4	ME: 4; NE: 2
Coping potential	*it is the sensation of trusting in one's own capabilities of doing things*	*High coping potential* is part of experiencing the emotion	HCP: 6	HCP: 8

CO (COnsistent); EX (EXpected); ON (ONself); DI (Does Increase self-esteem); PP (Person has the Power); PR (PRedictable); ME (Mental Effort); NE (No Effort); HCP (High Coping Potential)

Table 5.6. *Appraisal structures of confidence* (total participants per activity=8)

Overall, the results of the research indicate that to experience confidence there has to be motivation consistency, which is in line with Ellsworth and Smith (1988). Confidence is an emotion that is expected. Agency is typically assigned to oneself. However, when self-expression is involved, e.g. in a social context, the role of other people is important. Experiencing confidence seems to increases self-esteem and when experiencing it the user has the power to control and direct the situation. More so, in line with Ellsworth and Smith (1988), the experiencer has an idea of what

is going to happen next. For effort it was not possible to identify a clear pattern as some participants thought that it involves mental effort and others no effort at all. In *Table 5.6* the effort row shows the values for mental and no effort respectively. An example of mental effort is when the user is dealing with a complex situation and an example of no effort is when the user is very familiar with the product. High coping potential is typically involved when experiencing confidence, e.g. when the user accomplishes a difficult task and gains confidence.

The temporal aspect of confidence is the here and now, i.e. the result of an immediate event as in the case of confirming expectations or successfully completing a challenging task. In products, in particular, once the user has experienced confidence with them, the emotion will be present until something unexpected and wrong occurs with the product.

Thought-action tendencies for confidence

Three tendencies were identified in relation to confidence. These are now presented indicating in brackets the number of participants who chose it for activity A and activity B respectively.

When experiencing confidence users feel *reassured* (7; 5); there is certainty involved and this depends on the person's performance or the reliability of the product. More so, reassurance is in line with the idea of being free from doubt proposed by Desmet (2012). A tendency that emerged from activity A is *savour* (5; 1). Participants reported that they savour the period in which they feel confident. This may have occurred only with participants from activity A because they already have a 'relationship' with the product, and they may have remembered different moments in which they savoured feeling confident. A tendency which emerged from activity B is *maintain* (3; 5). Participants reported that they would maintain the product if it makes them feel confidence. Participants from activity A may have ignored this tendency because they have already owned the product for some time.

Appraisal themes for confidence

Confidence is experienced when a person is certain to be capable to do what he or she intends to do. Users at times face difficult challenges aiming to succeed, and when they do, they experience confidence. In this case, products that support people

to face those challenges are 'attributed' some agency for experiencing confidence even though the actual agent is the user as he or she succeeded at dealing with the challenge (see Schwarz & Clore, 1983). This appraisal theme is also related to certainty as users have an idea of what is going to happen with products with familiar shapes or interactions. Previous research has shown that users create automatic expectations of products, and as a result they get ready to interact with them based on those impressions (Desmet, Ortiz Nicolas, and Schoormans, 2008). Finally, certainty may also occur due to simple repetition of a task with an artefact, and by doing so, consolidating the experience of confidence.

Confidence is also experienced when a person expresses his or her identity through the products owned. This theme includes the social aspect of confidence, e.g. when users want to look nice, or express their preferences through the use of specific products, like shoes, watches, or perfumes. This concept is in line with Belk (1988), who argues that our possessions are a major contributor to and reflection of our identities. Sirgy and colleagues (2000) also explain that a consumer's attitude towards a product is influenced by the matching of the product image with the consumer's self-concept. The greater the match between a product and the consumer's self-concept, the more likely it is that the consumer will have a favourable attitude towards that product.

5.3.3 *Inspiration*

This section presents the findings for inspiration.

Triggers of inspiration

For activity A, participants chose the following products as triggers of inspiration: bicycle (2), mobile phone (2), digital camera (1), computer (1), coffee machine (1), electricity reader (1), sewing machine (1), unicycle (1), eraser (1), electronic tablet (1), electronic book (1), and pot (1).

For activity B, the products that triggered inspiration were the Lego bricks (ranked by seven participants in the top two places), and the disposable water camera (ranked by six participants in the top three places).

Data analysis showed that inspiration is triggered when:

- The *user* performs a meaningful activity with the help of a product; these activities allow users to grow or show them new possibilities, e.g. reading a novel that enhances positive values of the human kind.
- The *user* encounters a 'smart' solution into a product; solutions that are ingenious and original, e.g. an eraser that uses a sophisticated mechanism to release the eraser tape.
- The *user* finds beauty in how the product works, as well as, in its appearance, e.g. an attractive cooking pot.
- The *user* interacts with a product to perform activities that offer possibilities to create, e.g. a sewing machine helps a person create clothes, and at the same time live inspirational moments while using it.

These four triggers were identified from activity A and the last trigger was also identified from activity B.

From activity B, it was possible to identify also the inhibitors of inspiration. Participants do not experience inspiration with products that are irrelevant in their lives, that are conventional, or that do not offer opportunities for self-expression or creation. Examples of these are the wind-up lamp (ranked in the last place by five participants out of eight), the mouse, (ranked in the last three places by six participants), the hand drill, and the mini-lamp (both ranked in the last three places by four participants).

Appraisal structures for inspiration

The appraisal structures that are involved in experiencing inspiration are presented in *Table 5.7*. To explain how to read *Table 5.7* the example of the appraisal structure *agency* is now considered. For this appraisal structure the column 'description' presents the overall result, which indicates that inspiration is triggered by the *circumstances* and by *other people*. The values in the columns 'activity A' and 'activity B', instead, indicate that four out of eight participants to activity A found that inspiration is triggered by the circumstances and three out eight by other people. At the same time six out of eight participants to activity B shared the view that inspiration is triggered by the circumstances and five out of eight by other people. Hence, this result shows agreement between participants to an activity and across activities.

Appr. Structures	Example	Result		
		Description	Activity A	Activity B
Motivation	*The situation was definitely consistent with what I wanted*	The situation is *consistent* with what the person wants	CO: 8	CO: 6
Expectedness	*It is unexpected, somehow inspiration comes without announcing it*	It is an *unexpected* event	UN: 7	UN: 8
Agency	*I think that the circumstances because you need something else to inspire you*	It is triggered by the *circumstances* and *other people*	CI: 4; OP: 3	CI: 6; OP: 5
Self-esteem	*It increases self-esteem, if you have a good idea it makes you feel better yourself*	It *does increase* self-esteem	DI: 7	DI: 5
Controllability	*You have the power. It is about doing something proactive*	*The person has the power* over the situation	PP: 7	PP: 6
Predictability	*I do not feel particularly strong about what is going to happen next*	*Unpredictable,* the person does not know what is going to happen next	UP: 6	UP: 7
Effort	*Physical and mental, but I do not see the effort as negative. It inspires you to take actions*	It requires *mental and physical effort*	ME: 5; PE:5	ME: 6; PE: 1
Coping potential	*The challenge makes things more attractive and yes more inspiring*	In some degree *high coping potential* is involved	HCP: 4	HCP: 5

CO (COnsistent); UN (UNexpected); CI (CIrcumstances); OP (Other People); DI (Does Increase self-esteem); PP (Person has the Power); UP (UnPredictable); ME (Mental Effort); PE (Physical Effort); HCP (High Coping Potential)

Table 5.7. *Appraisal structures of inspiration* (total participants per activity=8)

Overall, the results of the research indicate that to experience inspiration there has to be motivation consistency. Inspiration is unexpected. The emotion is triggered either by an external factor assigned to the circumstances (events, activities or products) or by other people. In *Table 5.7* the agency row shows the values for the circumstances and other people respectively. The experiencer is 'touched' by that external event, which indicates its significance. Experiencing the emotion impacts

self-esteem and the experiencer has the power to influence or direct the situation. Nevertheless, the experiencer does not know what is going to happen next. The emotion requires mental and physical effort and coping potential is also involved as result of being inspired. In *Table 5.7* the effort row shows the values for mental and physical effort respectively. In the state of inspirations participants use their skills to pursue or make an idea concrete.

The temporal aspect of inspiration is the here and now. Once the experiencer is touched by the external event, he or she can reflect on the situation or take further actions. Nevertheless, inspiration is also related to the future, feeling inspired makes people imagine positive alternatives about their (or other's) future. This is in line with Desmet (2008) who suggests that when experiencing it there is a positive future expectancy involved.

Thought-action tendencies for inspiration

Six tendencies were identified in relation to inspiration. These are now presented indicating in brackets the number of participants who chose it for activity A and activity B respectively.

Users *identify with* (5; 4) a product or situation that triggers inspiration. This is in line with the push idea of Desmet (2008), consumers do notice the objects that inspire them. They also want to *get their hands on* (4; 5) the product that triggers inspiration. Users also *reflect on* (5; 6) or think deeply about the product or event that triggers inspiration. As a result of being inspired they tend *to create* (5; 7) something out of it. This creation can be tangible, like doodling, or intangible, like elaborating in an idea. This is also in line with Desmet (2012), who suggests that the inspiration state stimulates the creative thought or activity. The previous action tendencies were similar in both activities. However, one inconsistency was related to pay attention (8; 3). All participants from Activity A reported that when experiencing inspiration they *pay attention* to the product or event. Participants from activity B felt 'controlled' inspiration, which may have not been strong enough to catch their full attention. A tendency that emerged from activity B is that participants tend *to open up* (3; 6) about the situation in which they are in when experiencing inspiration. This indicates that participants saw new opportunities out of the event, product or person that triggered inspiration.

Appraisal themes for inspiration

Inspiration is experienced when a person unexpectedly identifies with an idea, an artefact or other people that show possibilities to grow and flourish. Users seek to grow and develop, and inspiration is linked to this. For example, through an e-reader the user can gain knowledge and stimulate their imagination but without the hassle of having many books that also take physical space. In addition, a user can experience inspiration when an object shows possibilities to solve a particular issue. For example, the e-reader in itself offers new possibilities when reading such as sharing comments with other consumers over the internet. In a way the e-reader helps the user improve their current situation and create a new one.

5.3.4 *Sympathy*

This section presents the finding for sympathy. Sympathy was reported to be a confusing emotion by participants. Three main reasons emerged to explain this issue. First, the situation in which sympathy is experienced is linked to an undesirable event which may imply that something wrong has happened. Second, various participants reported that they do not experience sympathy with products. Third, when a person assigned sympathy to products the meaning was towards friendliness and empathy. These reasons have to be considered when reading the results reported below.

Triggers of sympathy

For activity A, participants chose the following products as triggers of sympathy: travel bag (1), Mp3 player (1), hair drier (1), electric toothbrush (1), laptop (1), bicycle (1), mobile phone (1), hair straightener (1), laundry machine (1), microwave oven (1), helmet (1), and glasses (1).

For activity B, the products that triggered sympathy were: the mini-lamp (ranked in the top three places by six participants) and the disposable water camera (ranked in the top three places by five participants).

Data analysis showed that sympathy is triggered when:

- A *product* which the user appreciates is subject to an unpleasant event.
- The user is in touch with a *product* or *event* that symbolise sadness, e.g. a

travel bag that is a memory of missing family parties or an iPod that delivers sad music.

- The user appreciates the role of a *product* in easing his or her life, e.g. glasses that help a user manage a disability.
- A person sees that *another human* been does not use a product that could help them protect their physical integrity, e.g. not wearing a helmet when riding a bicycle.
- A *product* looks cute and delicate, e.g. the mini-lamp.
- The *user* relies upon some products to show their support to loved ones, e.g. a card to show sympathy about an unfortunate event.

The first four triggers were identified from activity A and the last two from activity B.

From activity B, it was possible to identify also the inhibitors of sympathy. Participants do not experience sympathy when the products are not associated to contexts in which the emotion is experienced. An example of this is the hand drill (ranked in the last place by six users out of eight) that is commonly used in workshops. More so, participants do not experience sympathy with products that are unpractical and unfriendly. In this particular study the chopping board used was assessed as impractical (ranked in the last three places by six participants out of eight).

Appraisal structures for sympathy

The appraisal structures that are involved in experiencing sympathy are presented in *Table 5.8*. To explain how to read *Table 5.8* the example of the appraisal structure *agency* is now considered. For this appraisal structure the column 'description' presents the overall result, which indicates that sympathy is triggered by the *circumstances*. The values in the columns 'activity A' and 'activity B', instead, indicate that seven out of the eight participants to activity A found that the circumstances (events or products) triggered the emotion and seven participants to activity B shared this view. Hence, this result shows agreement between participants to an activity and across activities.

		Result		
Appr. structures	**Example**	**Description**	**Activity A**	**Activity B**
Motivation	*The situation is inconsistent with what I want because otherwise I would not feel the need to comfort them*	Slight preference to the situation being *inconsistent* with what the person wants	IC: 4	IC: 5
Expectedness	*It is expected in the sense that if I am put in front of a situation that normally elicits sympathy I will feel it. It might be unexpected because I do not expect the situation to happen*	It is *expected* to show sympathy to close friends or relatives but the situation is unexpected	EX: 6	EX:3
Agency	*I think that the circumstances because it is usually something that happens to someone else that makes you feel sympathy*	The *circumstances* trigger the emotion	CI: 7	CI: 7
Self-esteem	*I think is fairly neutral*	It *does not* increase self-esteem	DNI: 4	DNI: 6
Controllability	*You are genuinely trying to improve the situation when you are feeling sympathy*	*The person* has the power over the situation	PP: 6	PP:5
Predictability	*You attempt to improve the situation but you do not really know*	Slight preference for *unpredictability*	UP: 4	UP:5
Effort	*Physical effort to deal with the emotion, mental effort to understand the situation*	It requires *mental* and *physical* effort	ME: 4; PE: 6	ME: 6; PE: 0
Coping potential	*It is related to easy to use products, they are not demanding something from you*	*Coping potential is low*, products are friendly	LCP: 5	LCP: 4

IC (InConsistent); EX (EXpected); CI (CIrcumstances); DNI (Does Not Increase self-esteem); PP (Person has the Power); UP (UnPredictable); ME (Mental Effort); PE (Physical Effort); LCP (Low Coping Potential)

Table 5.8. *Appraisal structures of sympathy* (total participants per activity=8)

Overall, the results of this research indicate that to experience sympathy motivation can either be consistent or inconsistent with the will of the person. The theory does not align with the latter. Lazarus (1991), in fact, has suggested that there is consistency with the person's motivations. Sympathy is expected to be experienced.

However, the emotion is triggered by circumstances (events and products) that are unexpected, e.g. an accident. For self-esteem it was not possible to identify a clear pattern. When experiencing sympathy, it seems that the experiencer has the power to influence or direct the situation. At the same time it seems that it is difficult to predict how the event is going to unfold. The emotion requires mental effort from the experiencer and typically there is low coping potential involved. In *Table 5.8* the effort row shows the values for mental and physical effort respectively. Participants described their products as easy to use and as a result they do not represent a challenge.

Two disagreements between activities are explained next. In activity B, three participants reported that experiencing sympathy was expected and the other five unexpected (see *Table 5.8*, expectedness). The five participants focused on the situation, which was reported as unexpected, instead of experiencing the emotion, which under the given circumstances is expected. Participants from activity B also reported that they only needed mental effort when experiencing sympathy (see *Table 5.8*, effort). This difference, in comparison of the results from activity A, may be related to the set-up of the study. Participants from Activity A had more time to reflect on the emotion, as well, as on the situations involved when experiencing sympathy.

The temporal aspect of sympathy is the here and now, and it lasts until the situation is solved or the event has happened. This is evident for the case of undesirable events. When sympathy is understood as friendly and supportive the emotion will be linked to the product for a long period of time.

Thought-action tendencies for sympathy

Six tendencies were identified in relation to sympathy. These are now presented indicating in brackets the number of participants who chose it for activity A and activity B respectively.

When experiencing the emotion, users *pay attention* (6; 6) to the person, situation, or product that triggers it. They *approach* (4; 5) the person or product. They *identify with* (4; 6) the other person or product. They *take care* (4; 6) of the person or product. They also tend *to accept* (4; 6) the situation in which they are in and *reflect on* it (3; 6), which indicates in-depth thinking in relation to the situation or event that occurred.

Appraisal themes for sympathy

Sympathy is experienced when a person realises that an undesired event has happened to: a loved one, or a product that they are attached to. Users reported that they were emotionally attached to some products, especially those that they rely on to do multi-tasks, e.g. a mobile phone. When they found out that an undesired event happened to the products that they cared for, a feeling of sympathy was elicited. This is not necessarily seen as positive due to the circumstances, and explains in some degree why experiencing sympathy is inconsistent with participant's motivations.

Sympathy is experienced when a product is kind and supportive towards the person or others. This appraisal theme includes the extended concept of sympathy to friendliness and empathy. Users experience sympathy when a product helps them complete a task in an easy way.

5.3.5 *Overall results*

Based on the appraisal themes that we have identified it is clear that the four emotions are triggered by different conditions. The appraisal structures of the four emotions are now compared to highlight detailed differences. The data reported in *Figure 5.9* presents the combined results for activity A and activity B, which equal to sixteen data points per emotion. This, however, does not apply to the appraisal structures agency and effort because participants could choose multiple options. For example, note that for the appraisal structure agency and the emotion confidence the sum of answers is higher than sixteen because participants chose 'oneself' 16 times and 'circumstances' 9 times. It can also be seen in *Figure 5.9* that the eight appraisal structures are coded with different colours, e.g. grey for motivation. The variation per appraisal across the four emotions is indicated with different shades, e.g. dark grey is used in sympathy for the motivation appraisal. This indicates a variation in comparison with the other emotions.

	Motivation	Expectedness	Agency	Self-esteem	Controllability	Predictability	Effort	Coping Potential
Anticipation	Consistent (15)	Expected (13)	Circumstances (13) Oneself (10)	increase (9) does not (7)	control (13)	Predictable (12)	Mental (11)	Low (11)
Confidence	Consistent (16)	Expected (15)	Oneself (16) Circumstances (9)	increase (12)	control (15)	Predictable (11)	Mental (8) & physical (7)	High (14)
Inspiration	Consistent (14)	Unexpected (15)	Circumstances (10) Other people (8)	increase (12)	control (13)	Unpredictable (13)	Mental (12)	Medium (9)
Sympathy	Inconsistent (9)	Expected (9)	Circumstances (14) oneself (10)	does not increase (10)	control (11)	Unpredictable (10)	Mental (12)	Low (10)

Figure 5.9. *Overall comparison of the four emotions regarding appraisal structures*

Figure 5.9 shows the following characteristics of emotions.

- Anticipation is different from the others because under the circumstances in which the emotion is experienced it is 'expected' to feel it. In addition, agency is assigned to those circumstances, i.e. events, activities or products, and in less degree oneself.
- Confidence is different from the others because agency is assigned to oneself and high coping potential is involved when experiencing it.
- Inspiration is different from the others because it is triggered by an unexpected event and while experiencing it users' self-esteem increases.
- Sympathy is different from the others because it seems to be inconsistent with what users want. It is also unpredictable how the event is going to develop.

The four emotions share one similarity, experiencing them allows the user to have control over the situation.

5.4 *Discussion*

The aim of this study was to develop a deep understanding of anticipation, confidence, inspiration and sympathy. Detailed descriptions of these four positive emotions were produced, focusing on triggers, appraisal structures, thought-action tendencies and appraisal themes. Previous research has stressed the importance of studying positive emotions and offering a detail view of them (e.g. Fredrickson, 1998; Fridja, 1986). The first contribution of this study is new and rich knowledge

about the four emotions. The second contribution is the set-up used to understand how users experienced these emotions. These two topics are addressed in detail in the next paragraphs.

The products that participants to this study chose as triggers of the four emotions seem to be artefacts that help them perform activities, which are enjoyable, pleasurable and have significance in their life. This was particularly true for inspiration and anticipation for which participants brought products like bikes, e-readers, coffee makers, and digital cameras. Although less evidently, this trend can be seen also for confidence. For this emotion, participants chose objects like shoes, perfumes, bags, and even a scooter, which can be categorised as objects of self-expression. These objects seem to embody the pleasurable side of confidence. However, for confidence they also chose products that can be categorised as tools like computers, calculators, shavers, and pencils. This supports our approach to study pleasant experiences through positive emotions. On the other hand pleasure and enjoyment do not seem to be present in sympathy. Users do experience this emotion with products, but it does not mean that they enjoy it. The latter can be explained in two ways. First for sympathy participants chose products that are friendly and easy to use without necessarily being keen to use them. Second, sympathy is not necessarily seen as a positive emotion, due the circumstances involved in its experience.

In the introduction of this chapter it was argued that one of the reasons for choosing sympathy was to test its suitability with products. Previous research reported that this emotion is not preferred by users and is infrequently experienced (Ortiz Nicolas et al, 2013). This scenario was seen as an opportunity for designers to evoke a broader range of positive emotions in users. It could also indicate that the nature of the emotion is such that it is more difficult to experience with products. The results of this study indicate that users do experience this emotion as a result of human-product interactions. However, the conditions upon which it is experienced seem to be 'undesirable'. Desmet (2012) explains that sympathy may not feel pleasant, but it is often considered to be a positive emotion because it brings the benefit of sharing a burden. The results of this study were unable to demonstrate the latter. In contrast, the findings of this study corroborate the low preference for this emotion with products (Ortiz Nicolas et al, 2013).

In previous research inspiration was described as the experience of a sudden

and overwhelming feeling of creative impulse (Desmet, 2012). Based on our results inspiration is experienced when a person unexpectedly identifies with an idea, an artefact or other people that show possibilities to grow and flourish. It is true that when users are inspired a creative impulse is involved. Nevertheless, our findings indicate that the creative impulse is a result of experiencing inspiration, not its cause. This difference can be explained considering the research method employed in the two studies. In particular, Desmet (2012) relied on reports and questionnaires to gather his data, while this study employed interviews and written reports. An obvious advantage of interviews is that participants can discuss in detail their experiences, and directly report if they have actually experienced the studied emotions with products. The level of detail of the two investigations may also explain the difference.

Confidence is frequently experienced and preferred in human-product interactions (Ortíz Nicolás et al, 2013). In this study two appraisal themes were suggested. The first is related to overcoming challenges and the second to self-expression. Previous research has described confidence as the experience of faith in oneself or one's ability to achieve or to act right (Desmet, 2012). We did not identify the moral aspect of acting right, however overcoming challenges fits well with the idea of having faith in oneself or one's ability to achieve something. Additionally, self-expression is another relevant aspect to experience confidence.

Anticipation is an emotion linked to a positive future expectancy that is likely to take place (Lazarus, 1991; Desmet, 2012). This was confirmed in this study throughout the appraisal structure 'expectedness' and the thought-action tendency being eager for. These two researched aspects offered a clear understanding of anticipation, which was useful to confirm the future expectancy of anticipation.

In relation to the set-up of this study we now report the main lessons learnt. Overall, the results from activity A are supported by those from activity B. Looking at the details, however, there are differences between the data sets gathered from the two activities. We have explained these differences in the sections of appraisal structures and thought-action tendencies for each emotion. A topic that has not been addressed, however, is the quality of the data gathered from each activity. More elaborate answers and descriptions of emotions were gained from activity A than from activity B. There are two reasons to explain this difference. First, during activity A participants used products that they own and are familiar with. This helped them

give more detailed answers relying on their actual experiences. Second, the pre-activity that participants carried out helped them reflect on their experience of the emotion. Activity B, on the other hand, was useful to identify new appraisals and confirm the already identified structures, as well as, to understand immediate reactions and identify inhibitors of an emotion. A limitation of ranking products based on an emotion is that participants are forced into the emotion; as a result experiencing the emotion is weaker in comparison to the actual experience occurring in daily life. The main conclusion from the research approach is that assigning an emotion in advance makes users reflect on the emotion, and as a result richer information can be captured. Ranking products, on the other hand, give immediate access to the user experience of the emotion. Future studies may use a similar set-up to the one presented in this study with a slight change. A participant can bring his or her products as well as rank a preselected set when studying one emotion. In this way immediate and accumulative experiences can be better understood for that emotion.

It is now worth reflecting on our application of appraisal theory. Appraisal structures and thought-action tendencies were very useful to understand the four emotions.

Appraisal structures characterise internal or external aspects of an individual experiencing an emotion (Scherer, 2005). Eight appraisal structures were investigated in this study. These provided detailed knowledge of the conditions affecting the experience of the researched emotions. As an example based on the appraisal structures it was identified that experiencing confidence and inspiration affect users' self-esteem and that for all the emotions the experiencer will have control over the situation. In conclusion, appraisal structures helped identify finer differences in the experience of the emotions.

Thought-action tendencies offered an idea of what happens in users' mind. Fredrickson (1998) suggested that positive emotions broaden a person's momentary thought-action repertoire. This seems to hold true especially for inspiration. In fact, when experiencing inspiration users seem to broaden their thinking, e.g. they *pay attention to, identify with, reflect on, open up, get their hands on,* and *create*. Interestingly, some of these tendencies were also identified for sympathy, e.g. users *pay attention to, identify with, approach, take care for, accept, reflect on,* and *get their hands on*. Overall, it seems that when experiencing inspiration users explore possibilities and when experiencing sympathy they want to solve a problem. In the case

of anticipation, thought-action tendencies seem to impact on users optimism about a future event. However, in the case of confidence *savour, reassured, and maintain* were identified as tendencies and these do not seem to broaden users' thinking. This may indicate that there are some emotions that are more effective to broaden a person's thought action repertoire than others.

The descriptions of anticipation, confidence, inspiration and sympathy are a first step to generate a new body of knowledge about positive emotions and have the potential to be used to develop tools to support designers. Yoon and Colleagues (2012), for example, focused on modifying the appraisal *coping potential* to trigger interest. When the aim is to evoke one of the four positive emotions studied in this research designers can use the appraisal themes, appraisal structures and thought-action tendencies identified in this project as a starting point.

Desmet (2012) identified six sources that elicit emotions, i.e. products, meaning, interaction, activity, self and other. In our study we were able to identify two additional sources. The first one is an event, i.e. an important and planned public or social occasion. An example of an event eliciting an emotion is a party as in the case of anticipation. The second source is the outcome of an activity. An example of this is a song created with a musical instrument. People may feel satisfaction when playing music (activity) and they may experience joy only after they have created a song (outcome of the activity). Similarly, designers may experience surprise during the design activity and they may experience pride only when they have completed the design task and the result is good.

A future challenge to consider in user experience is to better understand the role of activities in pleasant experiences. Users develop preferences for some activities over others. These preferences may impact on users' impression of products. For example, a person who enjoys reading may have a positive impression about an e-reader just because he or she likes to read. This could be a potential bias, and therefore a challenge to consider, when a researcher is measuring the emotional impact of an e-reader. We acknowledge that activities are context dependent (Blythe and Hassenzahl, 2003); this, however, does not mean that users do not develop preferences for some activities. Future studies can consider this issue by, for example, asking participants if the assessed product helps them do an activity that they enjoy doing. Then data can be compared from those who liked/dislike the activity to

identify if there is an impact on the results based on the preference for the activity.

Limitations and further work

There are a number of limitations that have to be considered. First, the triggers identified in this study depend on the products that users chose, as well as, on the products that were pre-selected for the ranking activity. Carrying out similar studies with other products and in other cultures will be helpful to identify other triggers of the emotions as well as to confirm the triggers identified in this study. Second, the results of this study depend on the characteristics of the participants. We worked with young people with a high level of education and from different cultures. Studying the experience of emotions in human-product interaction with different populations may be useful to identify additional triggers of the studied emotions. Previous research in the field of pleasure identified significant differences between age and gender groups (Porter et al, 2008). Third, a more precise selection of appraisal structures and though-action tendencies for product design is needed. For example, it is interesting to know that some emotions enhance self-esteem. This knowledge, however, may not help designers to design for inspiration. On the other hand, novelty seems to be more adequate for design. Finally, similar studies can be improved by employing larger populations.

5.5 *Conclusions*

This chapter has presented research to explore in detail the experience of anticipation, confidence, inspiration and sympathy resulting from human-product interactions. Pleasant experiences with products are influenced by many elements, and the emotions activated in users are an important one. The first contribution of this research to the field of user experience is the introduction of detailed experiences of the four positive emotions. The second contribution is the set-up used in this research, which enabled us to explore recall and immediate experiences.

The research employed interviews to investigate the triggers, the appraisal structures and the thought-action tendencies of the four emotions. This approach was

useful to develop detailed knowledge about the emotions. In specific, the identified triggers of each of the four emotions can be means that designers could use to design for emotions. Pleasant experiences with products are influenced by many elements, and the emotions activated in users are an important one. The data collected from the remembered experiences is richer in comparison to the data from the immediate experiences. A factor that influenced this is that users who recalled the emotions used their own products, whereas users who experienced them used unfamiliar products.

The descriptions of the four emotions produced in this research indicate that each emotion has its own characteristics.

Anticipation is related to the future and this study identified that it is elicited by an external factor, i.e. a product, an activity, or an event. There is an additional factor that makes people experience anticipation, which is the promise to gain pleasure throughout an event, activity or product. This explains why people are eager to obtain a product that triggers this emotion.

Confidence is related to the here and now and it is linked to reassurance as it was explained based on the analysis of the triggers of this emotion. Confidence is experienced when a person is certain to be capable to do what he or she intends to do. It is also experienced when a person reinforces aspects that are relevant to the self through artefacts. These eliciting conditions seem to have a different impact on the intensity of the emotion. When a person is dealing with a challenge the experience of confidence seems to be stronger in comparison to experiencing confidence through familiar product appearance or user interaction.

Inspiration is linked to meaningful activities for the user. It is experienced when a person unexpectedly identifies with an idea, insight or object that shows possibilities to grow and flourish. In addition, this emotion clearly broadens a person's momentary thought-action repertoire. This result suggested that some emotions broaden a person's momentary thought-action repertoire more than others.

Finally, sympathy seems to be more appropriate for human-human rather than human-product interactions. It is experienced in situations in which another human is struggling. In a similar way, a person can experience sympathy through a product when this is perceived as valuable, and the product suffers an undesirable event.

This research confirmed the importance of studying pleasant experiences through emotions, which are a reliable indicator of the evaluation of experiences made by individuals.

Chapter 06

Designing for Positive Emotions

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All products stimulate an experience, however, not all products are designed for experience. Research in user experience aims to generate knowledge to design experiences into products, systems and services. This is an alternative to the current way of designing that focuses on satisfying product functions and it often ignores the resulting user experience. Therefore a shift is suggested in product design from a tool-oriented to an experience-oriented approach (Jordan 2003; Hassenzahl, 2010). It is also suggested that user experience should focus on the pleasant side of experience (Hassenzahl, 2010; Ortíz Nicolás and Aurisicchio, 2011). One way to accomplish this goal is to focus on positive emotions. Emotions are a promising aspect because they are at the heart of experience (Hassenzahl, 2010) and they colour it (McCarthy and Wright, 2004). In other words, emotions are a key factor that defines the experience as pleasant or unpleasant. Positive emotions represent an opportunity to better understand pleasant experience and design it.

Crilly et al (2008) have reported that designers claim to take into account emotions during the design process. In particular, these authors have stated that designers aim to trigger an emotional reaction in users through the appearance of products. However, it is unknown what emotional reactions the designers subject of their study were aiming at. In a study investigating pleasure and design, Porter et al (2008) identified that designers tend to rely upon 'quick and dirty' research methods, with little awareness of techniques and data specifically related to user pleasure. In addition, these scholars also identified that designers expressed great interest in a 'resource' that would give them access to information about the emotional needs of specific user groups (Porter et al, 2008). More recent studies have shown that designers have little knowledge about positive emotions (Desmet, 2012) and that when they are trying to evoke emotions in their designs they rely on self-referential

approaches, i.e. experimentation or solid concept definition (Ortíz Nicolás et al, 2013). Experimentation refers to trial and error processes, which aim at identifying the triggers of a positive emotion, while solid concept definition to the early proposal of a concept waiting for it to 'connect' with the user and elicit positive emotions in him or her (Ortíz Nicolás et al, 2013). These findings confirm the interest of designers in emotions and the need to approach their study systematically.

Even though positive emotions are important in user experience and designers are interested in them, there are little strategies that they could use to design for positive emotions. This chapter presents a study that aims at developing and testing the usefulness of two tools to elicit positive emotions as part of a design process. The process, consisting of three steps, was used to contextualise and structure the application of the tools. In particular, the research explores whether the design process and the tools employed were found useful or not and why by a group of designers.

6.1 *Design process and tools*

Design research is aimed, among others, at improving the design process and for this purpose it has proposed several methods. Dorst (2008) has argued that design methods are typically developed ignoring the differences between designers, design contexts and design objects. The latter is due to the fact that the focus is often placed on improving the design process based on efficiency and efficacy. A limitation of current research on design methods is, therefore, that the views and the role of designers have been excluded (Dorst, 2008). To overcome this issue there is a need to give more attention to the opinions of designers, i.e. the users of the methods (Daalhuizen, 2014). Acknowledging this issue, this study aims to explore the usefulness of two tools to elicit positive emotions as applied by a group of designers during a design process.

In order to address the research aim, it is important to identify which elements are important in the use of a design method. Daalzhuizen (2014) identified that there are at least three elements involved:

1) *The designer* with his or her goals and specific experience, the method mind-set, and the motivation and personality.

2) *The context* in which the designer is acting, including the design team, the organisational culture and infrastructure, the set of methods available, and the project stakeholders.

3) *The design task* including the design brief, the resources available and the problem stakeholders.

The next two sections introduce how the design process used in this study was defined and the tools were developed. A detailed description of the workshop employed to test them is introduced in *section 6.2*.

6.1.1 *Defining a process to design for emotions*

Emotional design aims to intentionally elicit emotions in users through designed solutions. Three design processes employed by researchers to design for emotions are reviewed below. It is noteworthy that these processes are the outcome of work which adopted appraisal theory as the underlying theoretical construct.

Desmet and Dijkhuis (2003), working in the context of redesigning a wheelchair to mitigate its unpleasant emotional impact, employed a four-step design process, see *Table 6.1*. The first step consists of identifying the emotional reactions that existing products trigger in users and people in their network. The second involves understanding why existing products triggered those reactions. The third requires creating a new design using the knowledge developed through steps one and two. Finally, the fourth step consists of evaluating the emotional impact of the new design with a group of users. In the research by Desmet and Dijkhuis the evaluation of the newly designed product confirmed that the user experience had been enhanced and the unpleasant emotional impact of the original design reduced.

Demir et al (2010), focusing on evoking joy and contentment in the context of a dinner, proposed another four-step design process, see *Table 6.1*. The first step consists of specifying the design theme (i.e. the activity to design for, the target group, and the emotional intention). The second involves identifying the concerns of the target group. The third consists of generating a product profile that matches the concerns of the target group. Finally, the fourth step focuses on creating solutions

based on the product profile. The intention of Demir et al was of testing the overall process that designers follow rather than testing the design solutions.

A more recent example of design process is reported by Yoon et al (2012). The aim of their research was to trigger interest through Mp3 music players. Focusing on modified appraisal structures, they reported a five-step design process, see *Table 6.1*. The first step consists of identifying the key appraisal structures of the emotion to be evoked. The second involves exploring different levels of the emotion under investigation as triggered by the product to be designed. The third consists of running a workshop to explore design options to elicit the emotion being studied. The fourth involves selecting and developing the best candidate solutions. Finally, the fifth step consists of evaluating the design solutions with a user group to confirm if they can evoke the predefined emotion.

Author	Main steps
Desmet and Dijkhuis (2003)	Identify existing emotional reactions to the product to be redesigned
	Understand those emotional reactions
	Redesign the product based on the gained knowledge
	Test the design solution with users
Demir and colleagues (2010)	Specify the design theme (having a dinner)
	Identify the concerns of the target population
	Generate a product profile
	Create solutions based on the product profile
Yoon and colleagues (2012)	Identify theoretical appraisal structures for the emotion 'interest'
	Understand the triggers of the emotion
	Run a workshop to generate design solutions that triggered interest
	Develop three design concepts
	Test the design solutions with users

Table 6.1. *Main steps followed for each design process*

The previous examples of processes were employed to design for emotions. An important characteristic of these processes is that they focus on emotions and these are used from the beginning of the design activity. This is in line with the idea that to design for pleasant experiences designers should consider positive emotions as early as possible.

Informed by the previous approaches to design for emotions, a three-step process was derived to be used in this project, see *Figure 6.1*. The three steps are as follows

1. **Select a positive emotion.** Based on the characteristics of the project, one or several target emotions are selected to be evoked by the design solution.
2. **Understand the emotion.** Based on theoretical and empirical approaches, the selected emotion or emotions are studied to understand their eliciting conditions.
3. **Create design solutions.** Based on the knowledge gathered in the previous step, designers create solutions that aim at eliciting the selected emotion or emotions.

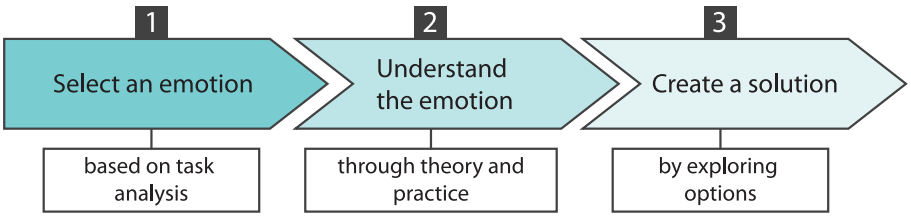


Figure 6.1. *The three steps of the design process*

The three-step process depicted in *Figure 6.1* is based on the processes identified during the literature review. It should be considered as a guide to support the structuring of design thinking when aiming to elicit specific emotions rather than a fixed process. Its main difference from previous approaches is that it focuses on the design phase excluding the evaluation phase that two of the three studies considered. This decision was made because we aim to test the potential usefulness of the process and the tools not the design outcomes. A similar approach was taken by Demir et al (2010). Now that the design process has been introduced the tools to be used in conjunction with the process are presented.

6.1.2 *Two tools to design for emotions*

Differently from previous research where emotions were investigated during the design project (step 2 of the design process - understand the emotion), in this study emotions were studied and understood in advance. Thirty-two interviews were carried out to understand how anticipation, confidence, inspiration, and sympathy are triggered during human-product interactions. The investigation of the four emotions was undertaken on the basis of appraisal theory, which in its simple form claims that emotions are elicited by appraisals or evaluations of events and situations. To create precise profiles of emotions it was judged important to develop rich and multi-component knowledge of the emotions through the use of appraisal structures and thought-action tendencies, see *Chapter 5*.

The understanding of anticipation, confidence, inspiration, and sympathy produced with this approach led to the creation of two tools called: *profile of emotion* and *design ingredients*. Although based on the same key insights, the tools differ in terms of content and layout. The *profile of emotion* tool aims to inform designers about the experience of an emotion as a result of human-product interaction. The *design ingredients* tool aims not only to inform about the experience of an emotion but also to suggest ideas that designers could implement during the design process.

It is important to note that the emotion sympathy was excluded from this study due to its incompatibilities with human-product interaction. In *Chapter 5* we reported that sympathy is triggered when an undesired event has happened to a person with whom or a product with which one is emotionally related. In our view experiencing this with a product is not a positive reaction. In addition, participants from the previous studies reported that they did not experience sympathy with products (see *Chapters 3*, *4* and *5*).

The following paragraphs explain the development of the tools using anticipation as an example.

Tool A: Profile of emotion

The *profile of emotion* tool provides a rich and multi-component description of an emotion. An important issue that was considered when creating this tool is to present knowledge about an emotion using everyday language. *Figure 6.2* presents

the *profile of emotion* tool for anticipation. It can be seen that the tool includes: 1) reasons for experiencing an emotion or triggers as well as inhibitors of the emotion, 2) appraisals structures, 3) thought-action tendencies, and 4) appraisal themes (which in *Figure 6.2* are referred to as statements). The tools for the other emotions are presented in *Appendix 8*.

Anticipation

1. Reasons

People experience Anticipation with products when:

- There is novelty involved, for example, the product has a new and unknown feature.
- There is a foreseen pleasure of performing a liked activity (e.g. tacking pictures) or an event (e.g. holidays or a party).

On the other hand, people do not experience Anticipation when the products are not useful or relevant in their daily life, e.g. a hammer for students of biotechnology. They also do not experience Anticipation when they are familiar with the product, when they already know what using the products all is about, e.g. the Lego bricks.

This emotion includes a temporal aspect, which is related to the future, looking forward to using a product or performing a pleasant activity. When experiencing Anticipation there is a positive future expectancy. Usually, people are aware of their Anticipation and it generally last until the person obtains the product or includes the first days of usage. Anticipation, result of activities or events, is expected to be experienced each time that a similar activity or event is going to happen.

2. Appraisal structures

When experiencing Anticipation, the situation is consistent with what people want. Under the given situation it is expected to experience it. This emotion is triggered by an external factor assigned to the circumstances/product; the person is part of those circumstances and the external factor is interesting to them. When experiencing Anticipation, people usually have the power to influence or direct the situation. Regarding predictability, participants know what is going to happen next, there is situational certainty i.e. confirming expectations. In relation to effort, mental effort is involved, e.g. people want to know more about the product that is triggering the emotion. When experiencing the emotion, the given situation is not challenging, as a result participants do not need to use their skills to deal with it. There is low coping potential involved.

3. Thought-action tendencies

When experiencing Anticipation people are eager for the situation, or event to happen. They want to get their hands on the product that triggered Anticipation. People pay attention to product/circumstance that triggers Anticipation. They also want to obtain the product or situation that triggers the emotion.

4. Statements

Anticipation is experienced when a person is certain that they will gain pleasure from a product, an activity, or an event. People are certain about pleasant products, events and activities, possibly because they have experienced them before, e.g. taking pictures, watching TV, or planning holidays.

Anticipation also arises when a person is certain that a product will deliver a new pleasant experience. This positive experience may result of a novel attribute of the product. Novelty seems to have a relevant role for experiencing Anticipation with products, especially when it is expected to be good and has not been experienced before. This also explains why when people are anticipating the product/activity there is a strong wish to use such product or that the activity or event to happen.

Figure 6.2. *Tool A: Profile of the emotion tool (anticipation)*

Tool B: Design ingredients

The *design ingredients* tool also provides a rich and multi-component description of an emotion, see *Figure 6.3*. In the development of this tool, compared to the *profile of emotion* tool, it was given substantial consideration to visual appearance. *Figure 6.3* presents *the design ingredients* tool for anticipation. It can be seen that the tool includes: 1) appraisal themes, 2) appraisal structures, 3) thought-action tendencies, and 4) design ingredients, i.e. ideas that designers could consider and use to evoke an emotion. The design ingredients are grouped under the following topics: future, newness, and excitement, see *Figure 6.2*. The tools for the other emotions are presented in *Appendix 9*.

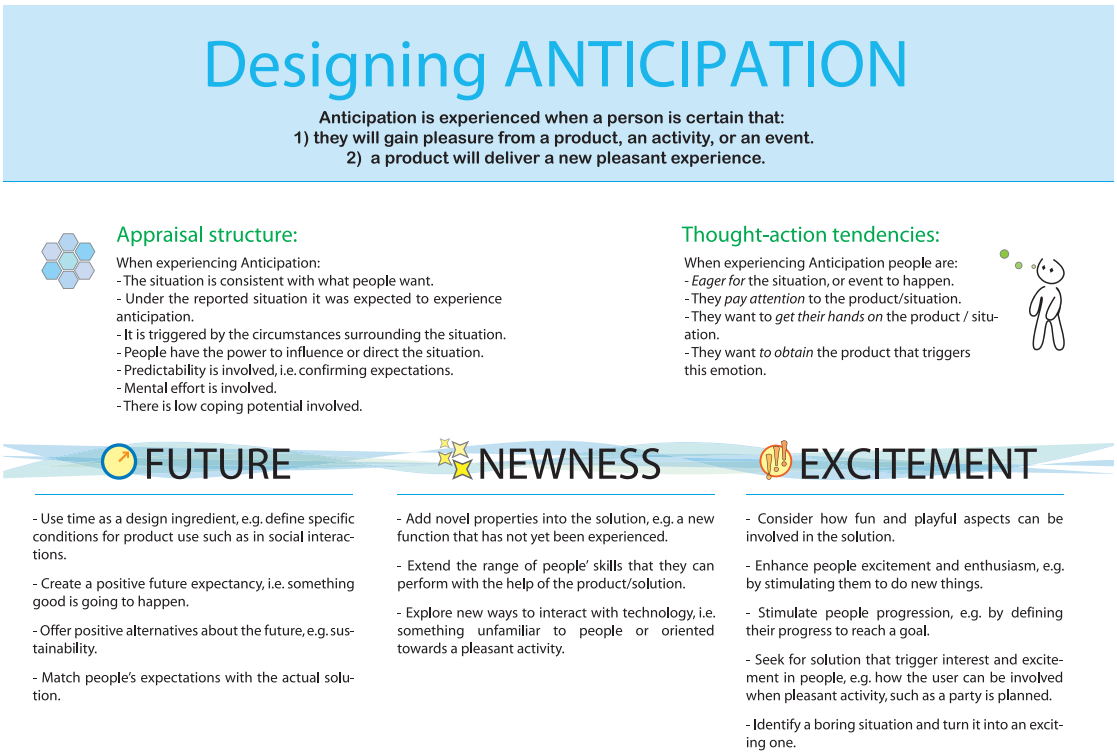


Figure 6.3. *Tool B: Design ingredients tool (anticipation)*

The *design ingredients* tool was developed through five steps. First, based on the triggers of an emotion, preliminary ideas were developed to evoke the emotion, e.g. in relation to anticipation the idea emerged to create a novel and pleasant situation that a person has not experienced yet. Second, a set of questions was proposed to make designers reflect upon the eliciting conditions of an emotion, e.g. in relation to anticipation the question emerged: how can designers create excitement? Third, it was decided to drop the question approach and to focus on developing ideas or design ingredients to elicit an emotion. The reason to pursue this approach is that questions were found to be too open and of limited support, whereas the design ingredients were judged to provide more guidance without being restrictive. Therefore, we reconsidered some of the preliminary ideas developed during step one and proposed new ideas. Fourth, the design ingredients were revised several times by the author of this research project. Fifth, the information was presented in a poster. The tools for the other emotions are presented in *Appendix 9*.

6.2 *Application of a design process and tools to evoke positive emotions*

This section presents the research approach, the participants to the research, the materials and the execution procedure.

6.2.1 *Research approach*

To test the design process and the tools, a one-day workshop was organised at Imperial College London. In the workshop a group of designers was exposed to the design process proposed in *section 6.1* and to the tools presented in *section 6.2*, and was subsequently asked to apply them while performing a design task. The design task required the participants to design a product with the aim to elicit a predefined positive emotion. A workshop setup was selected because it is a common approach to teach and apply design for emotions. Daalhuizen (2014) explains that learning to use new design methods in industry requires proper circumstances, which are often shaped by organizing 'training days' or 'workshops' around specific

skills and methods. Workshops are also used in academia, and previous research to investigate design for emotions has relied upon a workshop setup (Yoon, et al, 2012; and Demir et al, 2010).

To establish the potential usefulness of the process and the tools a mixed method research approach was employed. A questionnaire was used to capture designers' views on a number of pre-identified issues. This was followed up by a group discussion which was used to capture additional issues raised by the participants as well as the benefits and challenges of the process and the tools. We decided to evaluate the tools along with the process because their application is contextualised by the design process. The views reported by the participants to this research on the design process are closely linked to the application of the tools as these were at the centre of the process, while those on the tools are specific on the instruments for emotional design proposed in this project.

It is important to report that the three elements that are involved in the use of a design method, i.e. the designer, the context and the design task (see *section 6.1*), were considered to plan the design workshop. The next sections introduce information about the participants, the design context and task, the materials used, and the procedure.

6.2.2 *Participants*

Eighteen participants attended the workshop (twelve females and six males). This number of participants was considered a good trade-off between collecting the data necessary to test the tools and making the workshop manageable. Previous studies have relied upon smaller populations (see Demir, et al, 2010). The average age of participants was 27.5 years old (Min= 23; Max=42; SD = 4.42) and they had an average of five years of professional experience (Min=1; Max=12; SD=3.43). With the exception of one, the participants were postgraduate students of the following universities: Royal College of Art, Central Saint Martins, and Brunel University. Participants' background was in industrial and interaction design. All the participants had a good command of English, and four were native speakers. Participants were from the following nationalities: British, Indian, Greek, Swiss, Chinese, Brazilian, Japanese, Taiwanese, Italian, and French.

6.2.3 *Design task and context*

The design task consisted of designing a randomly assigned product to evoke one of the three emotions. For example, one of the designers was tasked to design a kettle that evokes inspiration. *Table 6.2* introduces the products that were used in the design task. The products were selected with the main aim to have a diverse set of objects that can be designed during a short workshop setting. In addition, it was decided to draw on the experience of previous studies carried out in this research project and use products similar to those which were found to trigger at least one of the three emotions to be studied. For example, cameras were found to trigger anticipation as part of the research in *Chapter 5*.

Emotion	**Products**
Anticipation	Toaster Kettle Camera Helmet
Confidence	Mp3 Player Kettle Speakers Helmet Drill
Inspiration	Toaster Kettle Speaker Hard disk Drill Lamp

Table 6.2. *Products designed based on three positive emotions*

In relation to the context, the design task was carried out individually. However, there was a group discussion in which designers talked about the information introduced by the tools. A detail report of the activities carried out in the workshop is provided in *section 6.2.5*.

6.2.4 *Materials*

Four main materials were used as part of this research, namely tool A (profile of emotion), tool B (design ingredients), *questionnaire 1*, and *questionnaire 2*.

Tool A is the *profile of emotion*. This was printed in black and white on A4 paper sheets. *Figure 6.2* presents the *profile of emotion* tool for anticipation, while those for the other emotions are in *Appendix 8*.

Tool B is the *design ingredients*. This was printed in colour on A4 paper sheets. *Figure 6.3* presents the *design ingredients* tool for anticipation, while those for the other emotions are in *Appendix 9*.

Questionnaire 1 was created to capture information about the background of the participants, and their knowledge of and views on emotional design. This questionnaire included three main sections. In the first, they answered demographic questions. In the second, they reported their knowledge about designing for emotions. In the third, they evaluated a set of items that were used to understand why participants would like to design for emotions. *Appendix 10* presents *questionnaire 1*.

Questionnaire 2 was created to capture data about the usefulness of the design process and tools. This questionnaire included four main sections. In the first, participants answered demographic questions (similar to those in *questionnaire 1*). In the second, they evaluated the usefulness of the design process. In the third, they evaluated tool A. Finally, in the fourth they evaluated tool B. *Appendix 11* presents *questionnaire 2*.

6.2.5 *Procedure*

The workshop was divided in three phases with specific activities in each, see *Figure 6.4*. The three phases with their activities and the data gathered are described in detail below.

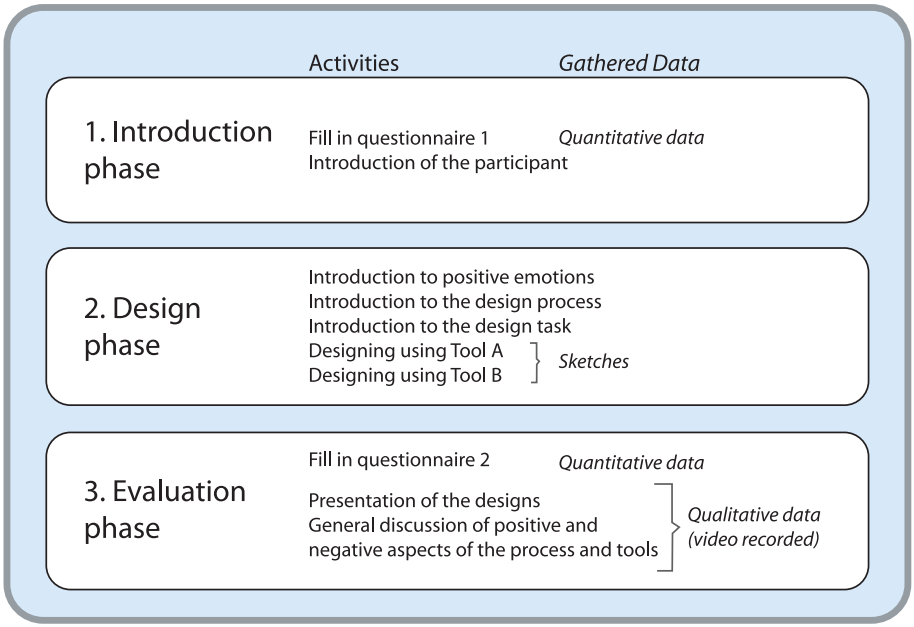


Figure 6.4. *Workshop structure*

Introduction phase. At the start of the workshop participants filled in *questionnaire 1* to report their knowledge of and interest in design for emotions. They were then asked to introduce themselves.

Design phase. Before the start of the design task, the workshop moderator delivered a short presentation on the role of positive emotions in user experience and product design. As part of the presentation, participants were introduced to the three-step design process and the concepts of appraisal structures, thought-action tendencies, and appraisals themes. Next, participants were handed out a randomly selected folder that contained: an emotion among anticipation, inspiration, and confidence; tool A for the corresponding emotion; and the name of a product to be designed, see *Table 6.2*. Six participants worked on each emotion and designed one of the eight pre-selected products.

The design task consisted of designing a product to evoke the assigned emotion, see *Figure 6.5*. For example, one of the tasks consisted of designing a kettle that evokes inspiration. To accomplish this aim tool A was provided and the participants worked

with it for approximately 45 minutes. At the completion of this initial part of the design, tool B was handed out and the participants worked with it for 75 minutes. Participants had in total two hours to complete the design task.



Figure 6.5. *Workshop*

Evaluation phase. After completing the design task participants filled in *questionnaire 2* to evaluate the design process and tools. Participants then presented their solutions to the group. The last activity was a group discussion, in which participants discussed the pros, cons, and challenges of the design process and tools used. To stimulate the discussion, participants were offered some time prior to the discussion to capture their thoughts about these topics on A0 paper. Then, they exposed their ideas in the group session. This phase was video and audio recorded to capture in detail their views and be able to analyse, at a later stage, the designs and the general discussion.

6.3 *Results*

This section starts by presenting the background of the participants and continues by describing the results of the evaluation of the process and the tools.

6.3.1 *Background of the participants*

The knowledge of design for emotions that the participants reported to have is presented in *Table 6.3*. Each statement in *Table 6.3* was rated using a scale from 1 to 5 where '1=strongly disagree' and '5=strongly agree'.

	Please tell us what you know about designing for emotions:	**M**	**SD**
1	I have theoretical knowledge of design for emotions	2.67	1.03
2	I have used a specific design methodology to design for emotions in the past	2.39	0.78
3	I rely on self-experimentation when designing for emotions	3.89	0.83
4	I design aiming to evoke specific emotions	3.72	1.07
5	I know what emotions are relevant for designing	3.22	0.94
6	I have worked with users to explore what emotions they experience with products	3.44	1.04
7	I am not familiar with the field of designing for emotions	2.83	1.04

Table 6.3. *Knowledge of design for emotions*

From *Table 6.3* it can be seen that designers reported to have a level (2.67) of theoretical knowledge of design for emotions and to have made use to some extent (2.39) of specific methodologies to design for emotions. More so, they indicated to rely often (3.89) on self-experimentation and to aim rather consistently (3.72) to evoke specific emotions. To a less degree (3.22), they indicated to know the emotions that are relevant for product design. They also reported that they have some (3.44) experience of working with users to explore the emotional dimension.

Finally, participants indicated to have a level (2.83) of familiarity with the topic of designing for emotions.

The reasons that designers reported to design for emotions are shown in *Table 6.4*. Each statement in *Table 6.4* was rated using a scale from 1 to 5 where '1= strongly disagree' and '5=strongly agree'.

	Why would you design for emotions?	M	SD
1	To have better employability	2.89	0.96
2	To improve users' well-being	4.56	0.62
3	To explore a new aspect of design that I am interested in	4.61	0.50
4	To design more strategically	4.11	0.96
5	To acknowledge that I am designing for other human beings	4.56	0.86
6	To become a better designer	4.00	0.97
7	To design richer experiences	4.78	0.43
8	To enable users to interact better with products	4.67	0.59
9	To design products that may have better opportunities to succeed in the market	4.11	0.83

Table 6.4. *Reasons to design for emotions*

From *Table 6.4* it can be seen that participants agreed with the large majority of the reasons to design for emotions. Five reasons, however, emerged as stronger (from 4.78 to 4.56) than the others and these are: to design richer experiences, to enable users to interact better with products, to explore a new aspect of design, to acknowledge that one is designing for other human beings, and to improve users' well-being. It is interesting to note that at least four of these reasons are oriented towards the user. Three additional reasons that were judged important (from 4.11 to 4.00) to them are: to design more strategically, to become a better designer, and to design products that may have better opportunities to succeed on the market.

These reasons seem to be related to becoming a better practitioner.

6.3.2 *Evaluation of the design process and tools*

This section presents the results of the evaluation of the design process and tools using a combination of quantitative and qualitative data.

The design process

After completion of the design task the participants were asked to evaluate the usefulness of the process, the resulting design solution, and the task. The results of the evaluation based on a questionnaire are reported in *Table 6.5*. Each statement in *Table 6.5* was rated using a scale from 1 to 5 where '1= strongly disagree' and '5=strongly agree'.

	About the Overall Design Process (Selecting the emotion/getting knowledge about it/creating design solutions)	**M**	**SD**
1	I think that the overall design process taught in this workshop is useful for designing emotions	3.89	0.58
	ABOUT THE DESIGN SOLUTION		
2	My solution resulted from the design process and used tools	3.61	0.50
3	I like my design solution	3.61	0.50
4	I feel that my solution fulfils the aim of evoking the intended emotion	3.72	0.57
5	I am disappointed with my design solution	2.33	0.84

Table 6.5. *Evaluation about the design process, solution and task*

Table 6.5 shows that the participants agreed (3.89) on the usefulness of the design process. With respect to the design solutions, the participants also tended to agree (3.61) that these resulted from the process used. The solutions produced were liked (3.61) by the designers and thought to fulfil (3.72) the design aim. Regarding the design task, designers agreed that it was clear, achievable within the time constraint and not too difficult, see *Appendix 12*.

To understand why the design process employed was perceived as useful, a group discussion was started with the participants, which led to the identification of four reasons. These reasons are now presented with extracts from the discussion in italics. First, the design process was considered useful support to frame the design task from a different perspective. D3 '*When emotions are added into the design process, you see it in a different way. And it helps you relate it to other experiences maybe that created that emotion.*' Second, the design process was considered useful to think about the user as a human being and not as an abstract entity. D1 *'It helps see the user as a more interesting person rather than this fictional character that you sometimes imagine*'. Third, the design process was reported to stimulate idea generation. D11 '*You can actually brainstorm, be creative, and start with emotions as a starting point. And that helps as a creativity approach; an idea or a product is seen from a different angle that you would have not thought otherwise.*' Finally, the design process was perceived as an aid in the evaluation of how good a design is. D5 '*The design process is a very interesting approach. I think that it can be part of your design process to evaluate your own designs*.'

Continuing with the results of the evaluation we present now a richer example of how the process helped a designer frame the task of designing a drill. A design solution for a drill aimed at evoking inspiration can be seen in *Figure 6.6* as it was sketched by participant D3.

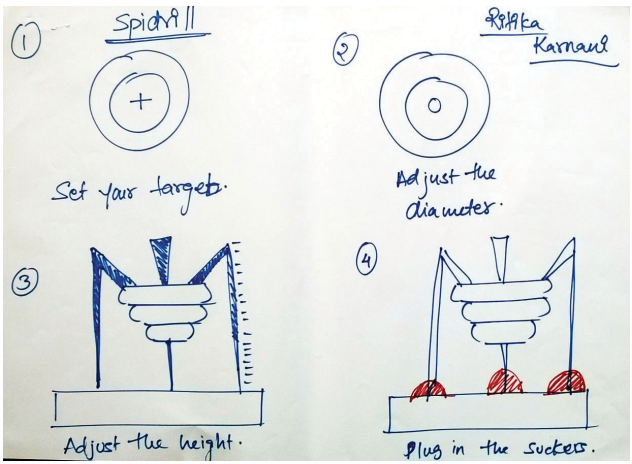


Figure 6.6. *A drill designed to trigger inspiration*

The solution is now presented using the words of the designer. D3 *'I have come up with something call Pet-Spydrill. The idea is to have this portable drill. The top part is like a telescope, so you just place it on the block of material that you want to drill. Then you can focus the spot using a screen, similar to a digital camera. You can focus on the spot that you want to drill on. The telescope has spider legs that can pop up. The legs are a measurement instrument, and you can adjust the height that you want to drill. The legs also have suction holders to fix the drill up on other surfaces'.*

Starting with the intent to elicit inspiration, the designer created a drill to stimulate users' creativity and shift its use from the traditional to a new context. The designer explained that the portability of the drill may stimulate users to try out new things and be creative. D3 '*Because the drill is portable, you can plug it onto anything and try new things, this excites you to do new things, and it inspires you to do new things, go crazy. Instead of being blocked, not knowing what to do with it.*' An identified thought-action tendency of inspiration is related to create or pursuit a new idea. This makes a direct reference to how the tools influenced the design solution. The knowledge of the emotion provided to the designer allowed focusing on relevant components of the emotion. In the case of the drill, the designer also considered her personal sources of inspiration to define some attributes of the product such as the shape. D3 '*I took the idea of the spider because as an insect that has been used for other inspiring designs, such as the lemon squeezer. As an insect, the spider is pretty amazing.*'

During the evaluation of the design process one challenge was identified in relation to the risk of manipulation that may derive from designing for emotions. P7 '*I see it as a challenge but also as a sort of danger if we try to control users' emotions.*' In addition, a challenge of the design task set-up was also identified. This is related to the forced match between some of the products with the emotions. D16 '*There is a limit about how far you can take in terms of designing a toaster. I mean if it is truly exciting there is probably something wrong.*' and D11 '*The appropriateness of the emotion is important, it is quite the reason to try to elicit that emotion through the product, and that comes more decent.*'

Tool A and tool B

Participants were also asked to evaluate the usefulness of tool A and B. The results of the evaluation based on a questionnaire are reported in *Table 6.6*. Each statement in *Table 6.6* was rated using a scale from 1 to 5 where '1= strongly disagree' and '5=strongly agree'.

		Tool A		Tool B	
	Items	**M**	**SD**	**M**	**SD**
1	It is useful because it provides the information that is needed to design	3.83	0.71	3.72	0.67
2	It is useful because it is effective to develop a design solution	3.44	0.70	3.67	0.59
3	It is useful because it helps me to improve my design skills	3.61	0.61	3.67	0.69
4	It is useful because it is clear to understand	4.11	0.58	3.94	0.54
5	It is useful because it gives a structured overview of the emotion	4.00	0.59	3.94	0.54
6	It is useful because I have space to explore my ideas	3.72	0.67	3.56	0.70
7	It is useful because I can use it for future projects	4.22	0.55	3.83	0.71
8	It is useful because it gives ideas that I can further develop	3.94	0.42	3.89	0.47
9	It is useful because it guides my design process	3.67	0.69	3.56	0.86
10	It is useful because it offers new knowledge of the emotion	3.89	0.90	3.78	0.94

Table 6.6. *Evaluation of tool A and B*

In general, the designers involved in this research reacted positively to both tools. The tools scored very similarly, which can be explained considering that they are based on the same source of knowledge. Tool A, the *profile of emotion* tool, was slightly preferred by designers in comparison to tool B, the *design ingredients* tool. The most relevant aspects to consider tool A useful are related to its clarity and potential to support future projects and provide a structured overview of an emotion suggesting ideas that

designers can further develop. However, it is important to highlight that tool A does not present design ingredients. Hence, item 8 in *Table 6.6* has to be interpreted as its generic capacity to frame a design task from a perspective that stimulates ideas. Regarding tool B the same set of aspects emerged, but their order of importance is different.

During the group discussion participants explained their own reasons to judge the tools useful. These reasons are related to the ten items presented in *Table 6.6*. First, designers explained that the tools provided a structured view of the emotions, which helped focus on the design process and support decision making. D1 '*The tools help structure the design process.*' and D12 '*they provided arguments that designers can use to justify their design decisions.*' Second, designers indicated that a benefit is related to the detailed knowledge of an emotion that the tools provide. D2 *'The tools also help approve or disapprove personal assumptions about the emotions*' and D11 '*They were good to raise awareness about the emotions and they improve designers' vocabulary to discuss emotions*.'

Continuing with the results of the evaluation we present now examples of how the tools helped a designer come up with an idea about a speaker, and another designer, working on a camera, appreciate an emotion through the provision of structured and detailed knowledge about it.

A design solution for a speaker that aims to evoke confidence is shown in *Figure 6.7* as proposed by participant D10.

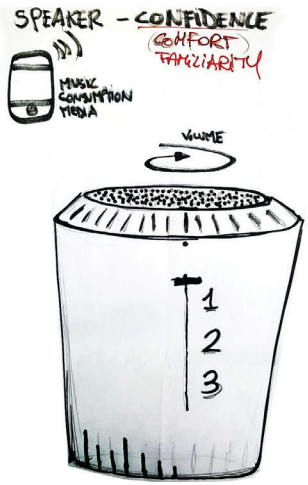


Figure 6.7. *Speakers designed to trigger confidence*

The design process to develop the speaker and the solution itself are now illustrated using the words of the designer. D10 *'I started the process by thinking how the music industry has evolved, from vinyl, cassettes, CDs, and Mp3s to the internet platform. These objects are the most influential, like the hardware of music. Now we consume just music, like Mp3s via a smart phone and now we have wireless speakers. The topic was confidence, comfort, and familiarity, so how do you reconstruct an object from the past and keep its elements to adapt to new technology? I isolated two meaningful symbols: my interaction which is like the symbol of the music with a grid, and the manipulation of sound by rotating the volume on the top. I also used sliders for changing the radio channel, which people slide vertically as many gadgets do it now. The speaker has the knob as well. I kept the rotation that I really like from low-fi objects because it is the visual feedback. With the old products we always had visual feedback. At present, you cannot visualise where the music is but in the past you could see the LPs and CDs rotating. I also kept the equaliser shape/colours. So, when I rotate the volume the equaliser follows it, so, you can see where the volume is.'*

This example shows that the explanation of the designer makes direct references to retaining the familiarity of appearance and interaction with the traditional design, see underlined lines. Throughout the study of confidence it was identified that one of its trigger is related to the user's familiarity with either the appearance or the interaction of an artefact. This was communicated to designers through the design ingredients tool and was implemented in the design of the speaker in *Figure 6.7*.

A solution for a camera that aims to evoke anticipation is shown in *Figure 6.8* as proposed by participant D11.

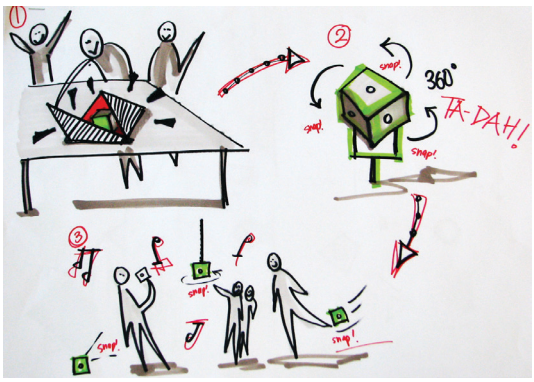


Figure 6.8. *A camera designed to trigger anticipation*

The design process to develop the camera and the solution itself are now illustrated using the words of the designer. D11 *'Anticipation is very strongly tied with time, so it is a journey and as a journey it starts in a shop. Packaging is part of the anticipation, unveiling the product when you get it at home. The actual camera is revealed from inside. It is a cube. Our camera does not have an additional screen, and it does not have a button on it. So, it is a simple cube that you can attach to the ceiling and spin around or roll it on the ground, or put it on the table and it takes 360 degree images of the room in a party or an event. It records the experience of an event that happens all the time. So, after you have used this camera the pictures are immediate the next day, so after that event has happened, after the camera has recorded that experience then you get the pictures the next day by e-mail. You have a record of what had happened in that event. It is also not orchestrated. If someone has a camera around taking pictures is very kind of orchestrated and it is like a performance rather than letting things happen organically.'*

This example shows that the explanation of the designer refers to future expectancy and how the solution considers this aspect. Earlier in this research we identified that anticipation is experienced when a person is certain that a product will deliver a new pleasant experience. It seems that the detailed knowledge of anticipation presented in the tools influenced the designer to include a future expectancy in the design of the camera in *Figure 6.7*. All the designs generated during the workshop can be seen in *Appendix 13*.

On the other hand, the tools were found to have limitations. The first is that the knowledge is repetitive and not enough visual. D3 '*The tools can be visually improved to be more attractive for designers*'. This issue can be addressed by, for example, using pictures of a person experiencing the emotions. The second is that the tools make a generalisation of knowledge about emotions. D7 '*It is risky to put it in a sort of a tool that makes the designer thinks that just by following it he/she can create a universal solution. It is not that easy.*' and D10 '*Emotions are too subjective so it is difficult to generalise.*' The third is that the knowledge presented in the tools may depend on cultural aspects.

From the group discussion, designers reported a range of 'needs' to improve the ability of designing for emotions. The first one is a set of case studies upon which they can rely to understand how some products trigger positive emotions. D12 '*I*

think that having more products that are certain to evoke some emotions may help us to identify patters because sometimes is not obvious.' Participants also reported that having tangible objects that give them a more sensorial experience could help better understand the different appraisal structures of emotions. These should be interpreted as objects that they can interact with and experience the emotion from. In addition, designers requested some proof of influence regarding the success of eliciting the intended emotions in users, and in particular for the design process introduced in this study. Finally, some designers reported that they would like to have a more hands on and active approach to emotional investigation.

6.4 *Discussion*

This chapter has presented a study to develop and test the usefulness of a design process and two tools to evoke specific positive emotions through artefacts. The tools were evaluated as part of a design task which was carried out within the context of a three-steps design process. The designers involved in this research evaluated positively the process and the tools and provided reasons to justify their views.

The design process was used to contextualise application of the tools. The first step of the process consists of defining the positive emotions that the designer aims to trigger through the solution. The process was found to influence the participants to this study at various levels. To begin with the process helped frame the design task. For example, designers acknowledged that the process was useful because it defines the design activity from an emotional perspective. The process also enhanced designers' connection with users. For example, designers reported that by following it users were perceived more real, more interesting, and less imaginary. This is an important reason to design for emotions and it has the potential to shift attention from products to people. Finally, the process supported idea generation and design evaluation. These benefits seem to be more general indicating that thinking about positive emotions may be useful regardless of the design approach that one considers for the project at hand. In line with previous research focusing on emotions at the beginning of the design task, participants to this study judged the process

as supportive (Desmet and Dijkhuis, 2003; Demir et al, 2010; Yoon et al, 2012). In comparison to previous studies we were able to identify the reasons that underline the positive evaluation of the process and tools.

Regarding the tools, these were found to be useful for designers because they provide a clear and structured view of emotions. These benefits seem to align well with participants' view that the tools help raise awareness about the emotions and improve emotion related vocabulary. Previous research in design and emotions has suggested that enhancing designers' in-depth knowledge of emotions can have a positive impact on design practice (Desmet, 2012; Yoon et al, 2013). Future studies can explore this issue in further detail. More so, the tools were found to help designers develop new ideas, and to have the potential to be used in future projects. These benefits reinforce the idea that designers appreciated the potential of designing for emotions. On the other hand, participants expressed some concerns about the universality of the knowledge introduced to them through the tools. In this regard, the emotions studied in this research have been consistently identified in studies carried out in various cultures and in the context of human-product interactions (Desmet, 2002; Ortíz Nicolás and Hernández López, 2008; Desmet, 2012). Designers can contextualise the tools based on their target task and population. This is possible because it is the evaluation of an event that triggers the emotion, not the event per se (Roseman and Smith, 2001).

It is important to mention that designers did not think that the task was difficult to complete. In a previous study to investigate experience of emotional design, designers rated positive emotions as difficult to design because they are very intense, and there is a lack of knowledge about them (Ortíz Nicolás, et al, 2013). The design task employed in this research was found easy to complete for at least three reasons. First, in this study designers followed a structured design process that was supported by tools that give a clear understanding of the emotion. Second, the participants had design experience at postgraduate level and this is expected to have facilitated the flow of the workshop. Third, some of the designers were from design schools in which there is a strong focus on concept development, such as the Royal College of Art. This previous training may have had a positive influence in the completion of the design task. Finally, the goal to generate sketches that communicate the design output was manageable. It is relevant to consider that the difficulty to design for

emotions may also depend on the emotions (e.g. confidence versus inspiration) and triggers that designers focus on. It is easier to elicit confidence by focusing on familiar appearance and interactions in comparison to elicit it by defining a challenge that the user has to overcome. This may also impact on the intensity of the emotion that the user will gain. The overall results of this study suggest that with a structured process and detailed knowledge of emotions designers deal better with the task of designing for positive emotions. However, this is a preliminary study and further research is needed.

A concern voiced by the designers is related to the products used in the task. Designers reported that the outcome of the process could be improved with a better product selection. Although this is possible, it is worth mentioning that designers do not always have the freedom to decide what product they will work on. However, we acknowledge that the relevance of designing for emotions can be magnified by identifying cases in which the elicitation of positive emotions can lead to a stronger impact on users. Matching the right product with relevant emotions is important to create solutions that have an impact on users' well-being and quality of life. This, however, was not the aim of this study.

The evaluation of the process and tools is now considered in the context of the background of the participants to the study. The results of the research to profile the participants indicate a need to gain a better understanding of emotions. This is in line with previous research that has pointed out the lack of knowledge of positive emotions by product designers (Desmet, 2012; Yoon et al, 2013) and the use of 'quick and dirty' methods to deal with designing pleasurable experiences (Porter et al, 2008; Chhibber et al, 2004). It is clear that designers have tacit knowledge about emotions. This, however, is limited to personal understanding. Using tacit knowledge has surely helped designers deal with emotions so far. For example, previous research has reported that designers have satisfied the emotional and aspirational needs of the consumer through intuitive techniques, with no formal methodologies (Porter et al, 2008). The tacit knowledge also explains to a certain extent the self-referential approach to emotional design that designers have reported to follow (see Ortíz Nicolás, et al, 2013). The latter approaches, however, are problematic because they do not offer a systematic method to design for emotions. An alternative is to provide designers with detailed knowledge about positive emotions.

Previous research has also identified that providing designers with data that make them aware of the emotional needs of a target user group is something that is much sought after (Chhibber et al. 2004). Hence, the design process and the tools tested in this research seem to have offered to the designers a means to fill in this gap.

Interestingly many of the reasons that designers rated higher for designing for emotions are user oriented, e.g. to enable users to interact better with products, to acknowledge that they are designing for other human beings, and to improve users' well-being. This is in line with previous research that identified that designers have a sense of responsibility to elicit some positive emotions through their designs (Ortíz Nicolás, et al, 2013). This may be partially explained by the way in which designers are trained. Lectures on ergonomics or user centred design encourage them to consider the needs of users in the design process and solution. It can also be the case that the designers' ethical considerations may be involved in this sense of responsibility, i.e. the moral principles of the designers.

Overall in this study the evaluation of the process and tools focused on the designers and it was very useful to understand how they reacted. As argued by Daalhuizen (2004) design methods will have an impact on the design outcome only if they meet the needs of their users. Thus, it is important to consider how designers experience processes and tools that are aimed at stimulating the design of specific issues.

Limitations and further research

This research has a number of limitations. First, the design task did not provide a context and a target group for designing the products. The context has an important role in user experience (Forlizzi, 2007; Ortíz Nicolás and Aurisicchio, 2011; Hassenzahl, 2010). In order to address this issue future studies could use more realistic design briefs. With respect to the target group, it is noteworthy that previous research on design and pleasure has identified differences between the emotions preferred by age groups (Porter et al, 2008). This means that the design considerations involved in eliciting pleasure for young and adults are expected to be different. It is also relevant to acknowledge that the process employed in this work focuses on positive emotions and therefore other relevant aspects of product development were neglected (see also Daalhuizen, 2014). Second, the designers were

asked to focus on eliciting only one emotion. It has to be reported that products do not elicit just one emotion. They evoke many positive and negative emotions. For example, products that users evaluate as 'great' evoked joy, satisfaction, confidence, amusement, inspiration, and pride (Ortíz Nicolás et al, 2013 a). Future research can explore how to include more emotions in the design process that can lead to pleasant experiences. Third, the participants to the workshop had a personal interest in the topic of emotions and this may have impacted on the positive evaluation of the process and tools. Fourth, we relied on three emotions, which are the result of detailed knowledge that we have developed. Additional knowledge of product-relevant emotions is needed to implement this concept of tool more extensively. Fifth, the tools were not randomised and this may have impacted on the preference of tool A over tool B. In the long term, research on emotions can be carried out in other cultures to understand the eliciting conditions of the emotions in those contexts. It could be also useful to extend current knowledge of emotions to joy, satisfaction, amusement, relaxed, fascination, respect, or surprise. These are relevant for product design (Desmet, 2012) and they were reported to be preferred in human-product interactions by a group of users (Ortíz Nicolás et al, 2013). Finally, this study relies upon a small population. Future studies can confirm its results with larger populations.

Based on the result of this study it is questionable whether two separate tools is the way forward. An option is to merge them while maintaining their principal qualities. Considering that designers reported that the tools could be visually improved, the *design ingredients* tool seems the best tool for further development. A revised version of such tool could, for example, include pictures of people experiencing the emotions as in Yoon et al (2013). Other aspects to consider as identified in previous research on design and pleasure (Porter et al, 2008; Chhibber et al. 2004) are related to developing tools which are accessible and engaging, offer opportunities to inspire and guide the design direction, and provide a resource to identify key issues early on.

Based on the positive response from designers, the next step of this research could be to test the revised tool with designers in a control group set-up. This set-up can lead to a better understanding of the impact of the design process and tool for designing emotions. The questionnaire to measure the impact of the process and tools can also be redesigned based on the benefits identified in this study.

6.5 *Conclusions*

This chapter has presented research to develop and test two tools to design for positive emotions. All products have the potential to elicit emotions in people, and this is because emotions are part of the human condition. Acknowledging this condition, design for emotions aims to intentionally evoke specific emotions in users through a design solution. This, however, is not an easy task and a method to decrease its difficulty is to provide designers with detailed knowledge about design-relevant emotions. The contribution of this work to the field of users experience is the creation of design tools to elicit anticipation, confidence and inspiration, which were tested as part of a three-step design process. The tools provide relevant information about emotions that can be contextualised in relation to the project that designers are working on. This approach to support the elicitation of positive emotions is new compared to previous work as it is based on building a generic knowledge base rather than creating it as part of a specific design project. In addition, the reasons why designers evaluated positively the process and tools were identified.

Design for emotions is an interesting topic for designers; this is because it is a challenge in itself and it is a way to acknowledge that designs will be used by other humans. Designing to elicit different emotions delivered distinct solutions. Participants to this study reported that the design process is useful to frame the design task from an emotional perspective; it improves to think about the user as a human being and not as an abstract entity; it stimulates idea generation; it is an aid to evaluate how good a design is. In relation to the tools, they provide a structured view of emotions, which help designers to focus on the design process and support decision; and it was a good reference to evaluate their personal understanding of the emotion.

Creating tools for designers is a challenge. In this research we focused on attributes of the tools like content and structure suggesting ideas to implement them in design practice. Participants to this study acknowledged these attributes. Designers also reported that visual presentation and ease of access are attributes that should be considered in the development of the tools. The utility of 'profile of emotions' and 'design ingredients' can be synthesised in participants' intentions to use them

in future projects. Scholars who aim to develop tools for designers can consider the issues identified during this research to create new tools.

These results may encourage other scholars to carry out further research in this field. Research opportunities are linked to creating profiles of positive emotions, and exploring the potential benefits of considering positive emotions on the different stages of the design process, e.g. idea generation, and validation. Emotions are central to the human life, and by tackling them, we have dealt with one of the key aspects of user experience. Experiencing positive emotions can result in pleasant experiences, which is also a requested shift in design.

Chapter 07

Overall Discussion and Conclusions

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This dissertation has investigated the field of pleasant experiences with durable products. The aim of the research was to develop new knowledge of pleasant experiences and use it to inform the development of methods and tools to support designers. Existing research on user experience has indicated that more work in this field has the potential to deliver benefits for both industry and academia (Hassenzahl, 2010; Den Ouden, Yuan, and Sonnemans, 2006; Kujala et al, 2011). In recent years industry has made constant reference to the experiences that consumers have with their products and services, and it is expected that new knowledge will help improve the pleasant experiences that industry offers to consumers.

In this project, we have characterised the main elements that determine user experience, developed new understanding of the role of positive emotions in pleasant experiences, and tested a design strategy to enhance pleasurable experiences with products. This chapter presents a summary of the main results, the overall discussion, the contributions, the limitations, future research, and the overall conclusions.

7.1 *Summary of main results*

The main results of this research are now presented as answers to the research objectives.

Objective A: *To undertake a critical review of the state of the art in user experience and to analyse, compare and synthesise existing knowledge.*

The literature on user experience was found to be disconnected. For example, existing frameworks have suggested some constituent elements of user experience

but these have not been analysed and synthesised. In this project current views of user experience were analysed and the results used to inform the development of a general framework, which includes four constituent elements and six aggregates of user experience, see *Figure 7.1*.

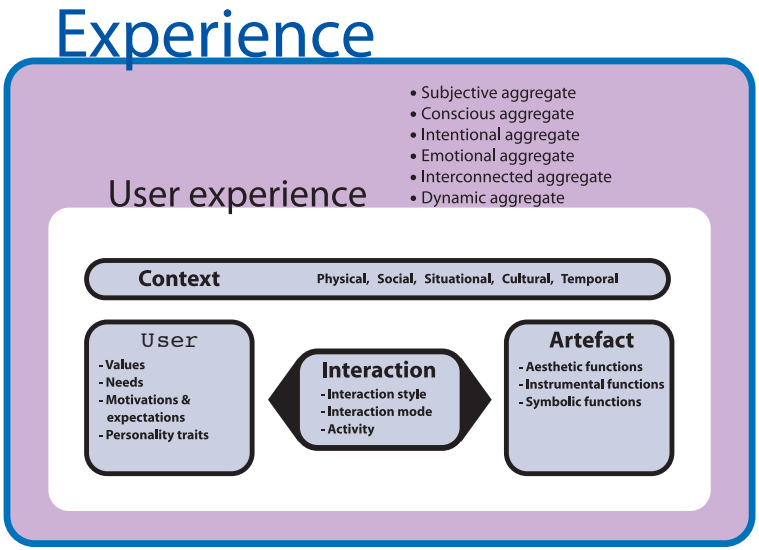


Figure 7.1. *Framework of user experience*

This work has been important to ensure that the field continues evolving based on a strong body of knowledge. The framework can be used as a platform for the discussion of issues related to user experience as well as to guide the design process when the aim is to enhance user experience. In addition, the following definition was proposed: user experience is the subjective, conscious, intentional, emotional, interconnected and dynamic encounter that a user has with an artefact through interaction, occurring in a particular context and time.

Objective B: *To investigate the experience of 'great' products by users in daily life.*

Experiences with great products were found to be pleasant and distinguished between pragmatic and significant. Pragmatic experiences refer to a utilitarian view of human-product interaction. Significant experiences, instead, stress the valuable role of the activities involved in human-product interaction. Significant

experiences offer benefits for users including possibilities for growth. More so, they acknowledge the active role that users have in human-product interaction. Finally, these experiences are significant because users re-affirm themselves through the activities or products involved. The descriptions of pragmatic and significant experiences provided in this research are based on the emotions and needs involved.

Objective C: *To investigate a set of twenty-five positive emotions in relation to frequency of experience (users), preference for experience (users), preference for elicitation (designers), difficulty of elicitation (designers), pleasantness (users) and arousal (users).*

Frequently-experienced emotions by users were: satisfaction, inspiration, desire, joy, amusement, and relaxed. Users could easily recall these emotions and provide examples linked to human-product interactions.

Highly-preferred emotions by users were: satisfaction, inspiration, confidence, joy, amusement and relaxed. Users indicated that these emotions bring goodness to them and are a sign of having made an adequate product choice.

Infrequently experienced emotions and non-preferred ones by users were: worship, sympathy, and lust. Users rejected the idea of experiencing these emotions with artefacts as they were felt inappropriate.

Highly-preferred emotions by designers were: curiosity, joy, surprise, confidence, inspiration, fascination, satisfaction, and pride. Designers perceived these emotions as appropriate to their work and indicated that by eliciting them users could appreciate their work.

Highly-difficult emotions to elicit by design were: love, hope, kindness, worship, inspiration, sympathy, enchantment, and euphoria. Designers felt that these emotions are too intense, poorly understood, and complicated to control.

Non-preferred and difficult to elicit emotions were: lust and worship. Designers rejected the idea to elicit these emotions as they were judged inappropriate.

The investigation of the arousal of twenty-five emotions assessed by a group of users led to the identification of three categories: exciting, median, and calm. The exciting emotions are: energetic, euphoria, amusement, desire, joy, love, inspiration, and lust. The median arousal emotions are: fascination, satisfaction, confidence, pride, anticipation, enchantment, surprise, courage, hope, worship, and admiration. Finally, the calm emotions are: relaxed, relief, kindness, dreamy, respect, and sympathy. Within each of the three groups different level of pleasantness, which

was investigated together with arousal, were identified.

Objective D: *To understand in depth anticipation, confidence, inspiration and sympathy, and form rich descriptions of these emotions.*

Anticipation, confidence, inspiration, and sympathy were profiled in detail focusing on their triggers, appraisal structures, thought-action tendencies, and thematic appraisals. The main characteristics of these emotions are reported below.

Anticipation is experienced when a person is certain that they will gain pleasure from a product, an activity, or an event. It also arises when a person is certain that a product will deliver a new pleasant experience.

Confidence is experienced when a person is certain to be able to accomplish an objective. It is also experienced when a person expresses their identity traits through products.

Inspiration is experienced when a person unexpectedly self-identifies with an idea, artefact, or other people that show possibilities to grow and flourish.

Sympathy is experienced when a person realises that an undesired event has happened to either a loved individual, or a product that they are attached to. Sympathy is also experienced when a product is kind and supportive towards a person.

Objective E: *To develop tools to elicit positive emotions and test their usefulness as part of a design process.*

Two tools named respectively *profile of emotions* and *design ingredients* were developed based on the knowledge gathered by studying anticipation, confidence, inspiration and sympathy. A emotion centric design process was synthesised based on a review of the literature. Designers evaluated the process and tools positively. In particular they reported that the process helped them direct their work towards the goal of designing for positive emotions. The knowledge on positive emotions was judged valuable to develop new ideas and establish a deeper connection with users. Designers also reported other benefits of exploring in depth positive emotions. Among these it is worth reporting that the process can help evaluate design solutions and select those that offer more pleasant experiences for users.

7.2 *Discussion*

The discussion is divided into five parts. The first looks at the understanding of pleasant experiences in product design developed during this project. The second reviews the strategies to design for pleasant experiences emerged during the research. The third reflects on the role of pleasant experiences in product development compared to traditional design approaches. The fourth revisits the framework of user experience in the light of the understanding developed during the empirical part of the research.

Pleasant experiences in product design

The results from the literature review and the studies to investigate great products and the nature of emotions confirm that users are interested to be in contact with products that elicit positive emotions and pleasant experiences (Hassenzahl, 2010; Hassenzahl and Tractinsky, 2006; Desmet, 2012). They also indicate that designers are interested in designing pleasant experiences. Nevertheless, it seems that at the moment designers rely predominantly on approaches based on their intuition and personal knowledge of positive emotions and pleasant experiences (Porter et al, 2008; Chhibber et al, 2004; Ortíz Nicolás et al, 2013).

Pleasant experience is an umbrella term that needs to be deconstructed to understand it (Desmet, 2012). This research suggested two typologies of pleasant experiences.

The first is linked to the experiences with great products, and these were named pragmatic and significant experiences. Pragmatic experiences are related to how well an activity can be undertaken with the help of a product. The pleasant side of pragmatic experiences is in the fluency of the instrumental function that users experience when interacting with a product. Significant experiences stress the valuable role of the activities involved in human-product interaction. These offer benefits for users including possibilities for personal growth. Significant experiences also acknowledge the active role that users have in human-product interaction. These experiences are significant because users re-affirm themselves through the activities or products involved. Significant experiences, as characterised in this research, share

some similarities with the definition of pleasant experiences suggested by Blythe and Hassenzahl (2003 p. 95). They argue that pleasant experiences are related to activities or objects that are absorbing and meaningful. According to these authors pleasant experiences become part of one's self-definition and are long-lived, i.e. users tend to stick to objects and activities that enhance them. Significant and pragmatic experiences differ in terms of pleasantness, with the former being more pleasant than the latter.

The second typology is linked to the arousal dimension of emotions, which enabled to distinguish pleasant experiences into exciting, median or calm experiences. This approach to typify pleasant experiences relies on the well-established tradition to study positive emotions and their dimensions, e.g. arousal and pleasantness (Scherer, 2005; Frijda, 1986; Russell, 2003; Roseman and Smith, 2001). Some experiences are pleasant because they trigger joy, euphoria, and inspiration, while others because they trigger relaxation and relief. The pleasure of exciting, median and calm experiences is directly linked to the emotions involved. Identifying pleasant experiences based on arousal is straightforward. However, a strong limitation of this typology is that it relies just on the physical dimension of emotions, while experiences rely on more complex factors, e.g. motivation.

These two typologies of pleasant experiences add to the typology based on universal needs suggested by Hassenzahl et al (2010). Their typology is interesting and relevant to design. However, in the case of products, pleasant experiences do not satisfy only one need, rather they satisfy many needs as shown in *Chapter 2*. Additionally, they identify that only some needs are linked to pleasant experiences. Further research is needed to define a more comprehensive typology of pleasant experiences.

This research identified that there are different levels of pleasure in human-product interactions and that pleasant experiences are linked to the activities undertaken with products, the richness of the interaction, the product attributes, the needs fulfilled, the emotions triggered, and the active role of users. Based on the results of this research the most pleasant experiences with products are those that rely upon the user, not the product, as in the case of the significant experience. This results supports the argument that design needs a shift from products to users (Jordan, 2003; Chapman, 2005; Hassenzahl, 2010; Ortiz Nicolás and Aurisicchio 2011; and Desmet, 2012).

Designing pleasant experiences

In this research we have argued for a systematic approach to the design of pleasant experiences. The results of this research have indicated four possible strategies to achieve this as follows: use the framework of user experience described in *Chapter 1* as a guiding tool to identify key issues to enhance user experience; aim to design for pragmatic or significant experiences; aim to design for exciting, median arousal or calm experiences; and employ the design process and tools described in *Chapter 6*.

The first strategy consists of using the framework of user experience. This includes four constituent elements, i.e. the user, the artefact, the interaction and the context. The context element of the framework is now taken as an example to show how designers can be prompted to consider the design of the human-product interaction during product design, see *Figure 7.2*. A sub-element of context is the social aspect involved in the experience. The framework can, for example, help designers identify if the product or service that they will design is an end to interact with other people. This will indicate the importance of the social context and therefore designers will know if they have to focus their skills and expertise on developing solutions that enhance social interactions. It is interesting to point out that the scenario implies a shift from the product to people.

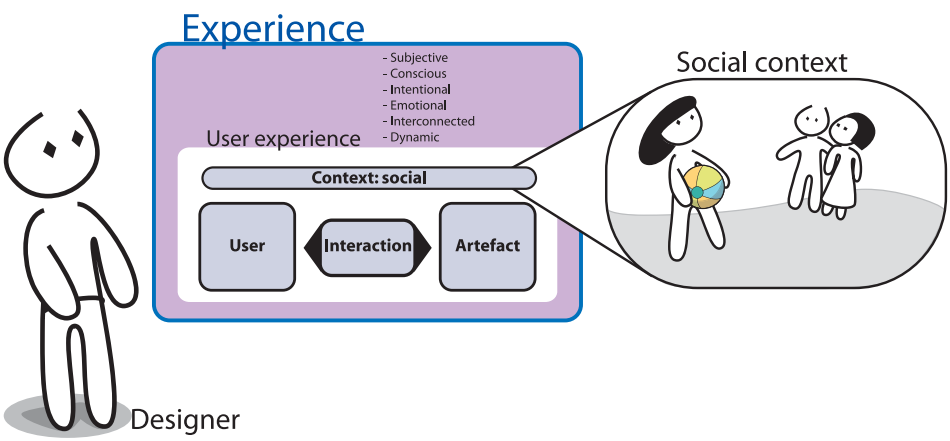


Figure 7.2. *A designer using the framework of user experience to identify design opportunities*

The second strategy consists of designing for pragmatic and significant experiences. We have suggested that the pleasant side of pragmatic experiences is linked to the fluency of the interaction with a product. Hence, designers can consider creating products that excel at their instrumental function and offer fluent interaction. This demands attention to the design of the interaction to enable users do what they want fluently and smoothly (see also Forlizzi and Battarbe 2004). The focus on creating a fluent interaction is complementary to approaches such as usability. Existing usability evaluations focus on effectiveness and efficiency. Usability specialists typically evaluate whether a person can complete a task in ten seconds, but they ignore if the person experiences the interaction as fluent, unobtrusive, or fragmented. We have also suggested that the pleasant side of significant experiences involves five key aspects, namely active agency, order, self, social-symbolic relatedness, and lifespan. This view emphasises the importance of meaningful actions by a developing self in complex and unfolding relationships (Mahoney, 2004). On this basis it is expected that a means to enhance significant experiences is to identify important issues for a user group and create solutions accordingly. A bottom-up approach to design for significant experiences could consist of creating products or services that fulfil needs such as pleasure, competence and self-actualizing, and elicit emotions such as joy, satisfaction, relaxed, confidence, amusement, inspiration, and pride. The reason to design for these needs and emotions as identified in the study of great products is that they play an important role in significant experiences. Following a top-down approach designers could identify and address relevant challenges for a group of people, e.g. sustainability, discrimination, mental health or gender inequality. Once designers have identified a potential challenge, they can focus their skills and expertise to understand this issue, and then propose potential solutions through products or services aiming to stimulate key aspects of significant experiences, i.e. active agency, relatedness, and self. Let us take gender inequality as an example of challenge and consider it in the context of toy design. Traditional toys like cars and dolls are 'assigned' to boys or girls respectively resulting in gender stereotypes. Hence, there is a need to develop toys that consciously avoid this issue and promote equality. A puzzle is a potential solution to start from as people do not assign gender stereotypes to it. In the development of solutions it is also important to involve the people who are interested in eradicating the issue or people who are directly affected by it. It is

expected that people who engage in the solution will consider the experience with the designed service or product as significant. As we have mentioned this is a top-down approach in which a key step is to identify a significant challenge for a group of people and then generate design solutions.

The considerations involved in designing pragmatic and significant experiences are different. In the former the designer can focus on creating a product that excels at its instrumental function and interaction, see *Figure 7.3*. In the latter, the designer has to consider that there are many factors involved, i.e. active agency, order, self, social-symbolic relatedness, and lifespan. A way to solve active agency, for example, is by creating solutions that stimulate users to grow and flourish, see *Figure 7.3*.

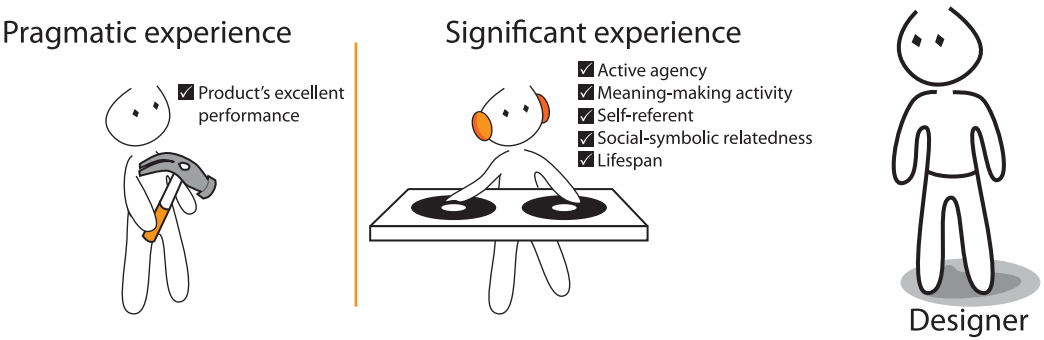


Figure 7.3. *Pragmatic and significant experiences as means to generate a pleasant experience*

The third strategy consists of designing for exciting, median arousal, or calm pleasant experiences. Eliciting relaxation and relief will lead to a calm and pleasant experience, while joy, euphoria and inspiration to an exciting and pleasant experience. This approach has potential because there are some contexts in which either a calm or an exciting experience are expected. For example, a hospital may be more suitable for calm experiences and an amusement park for exciting ones. Designers can consider in which context the product that they are designing will be used and define the type of pleasant experience accordingly. The emotions that are at the heart of calm, median arousal or exciting experiences can guide the design process, see *Figure 7.4*.

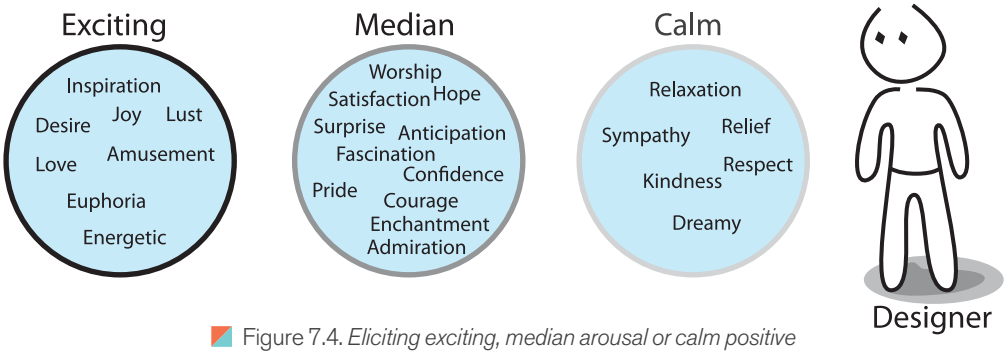


Figure 7.4. *Eliciting exciting, median arousal or calm positive emotions as a means to generate a pleasant experience*

Finally, the fourth strategy consists of adopting an emotion centric approach to design and this is possible because they are central to any experience. This idea was implemented in the design process and the tools that we developed and tested in *Chapter 6*. The process relies on three steps and is complemented with knowledge of positive emotions, see *Figure 7.5*. Using this process helped designers frame the design task from an emotional perspective, and create solutions accordingly. For example, confidence can be triggered by the good performance of the product or by the act of overcoming a challenge with the help of a product. These triggers point out strong differences in relation to the designed products. For example, eliciting confidence based on a product that works well focuses on the product, while eliciting confidence based on challenges focuses on the user. The design process emerged from this research is a systematic approach that represents an alternative to the self-referential approaches that designers rely upon.

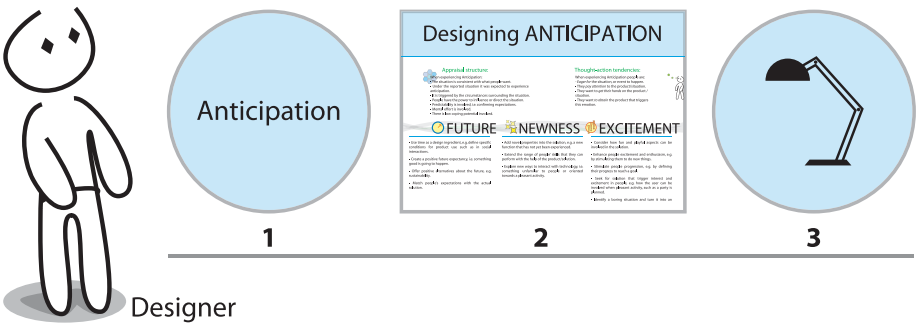


Figure 7.5. *A three-step emotion centric design process to generate a pleasant experience*

Considering that most of the products launched into the market fail (Krippendorff, 2006: p.187) and that the existing economic, societal, and environmental situation demands new ways of designing, it is worth asking if the strategies described earlier could help reduce the risk of product failure. Although product failure (and success) does not depend exclusively upon the work of designers, they have the potential to influence it.

The tool-oriented and the experiential approach

In this research it was found that products, which perform very well their instrumental function deliver pleasure to users, i.e. pragmatic experiences. This result is in line with the work of Burns and Evans (2000), who reported that when executed well the basic functionality of a product is a source of pleasure. On the other hand, the research found that to create richer pleasant experiences it is not sufficient to rely only upon the instrumental function and it is rather necessary to consider other design aspects (e.g. users' aspirations, self-image, values, needs and emotions), i.e. significant experiences.

A reason to investigate the role of pleasure in product design is that so far the development of products has been dominated by the tool-oriented approach (Jordan, 2003). This approach has traditionally focused on the instrumental function of products with an emphasis on usability and usefulness (Jordan, 2000; Tractinsky et al, 2000). Differently, the experiential approach aims at considering aspects that are traditionally excluded by the tool-oriented approach, such as emotions. The latter does not mean that the experiential approach intents to replace the tool-oriented one. It is, however, important to acknowledge that each approach leads to a different design output.

In the experiential approach the intended experience is defined at the start of the design activity, e.g. a calm experience, and then design decisions are made to create that experience. This approach can embody the tool-oriented one in terms of the instrumental function, which is an aspect that influences user experience (Jordan, 2000; Hassenzahl, 2010; Mahlke and Thüring, 2007). The instrumental function, therefore, has to be considered to achieve the intended experience. The tool-oriented approach, on the other hand, does not include the experiential one, because it can only focus on usability and usefulness, leaving out other relevant aspects. In other

words, designing a product based on the tool-oriented approach can enhance the pleasantness of the product experience if the instrumental function is well executed as in the case of pragmatic experiences. This, however, does not mean that by following the tool-oriented approach richer pleasant experiences would be delivered as in the case of the significant ones. In this context it is important to remember that users experience satisfaction during pragmatic experiences, but they hardly experienced joy, amusement or fun (see also Carrol and Thomas, 1988).

Overall, it seems relevant to develop awareness of the two approaches and how best to select among them depending on the design task at hand. A key aspect to consider is the aim of the design project. Sometimes, companies are interested in creating new experiences as a strategy to differentiate themselves from competitors. In these circumstances, the experiential approach is what is needed. The product type can also be used as a criterion to select among the approaches. For example, the design of toys and games seems to lend itself better to the experiential approach. Nevertheless, industry is also interested in creating products that need to perform just a specific instrumental function. For instance, designing pallets, containers or other similar industrial products requires considerations in which the experience may have little relevance. Designers also need to appreciate the trade-offs between the two approaches. By focusing on the tool-oriented approach the emphasis is on the instrumental function and only marginal levels of pleasure can be achieved. This happens when only the instrumental function is allowed to excel. Focusing on the experiential approach may offer further opportunities to enhance a pleasant experience. Designers, however, need to be trained in this approach considering that at present, they rely upon non-systematic approaches.

Pleasant experiences and product development

The development of new products should not only rely on economic reasons but also on the potential benefits for society and the living environment. Over recent years a number of philosophies have emerged which have tried to address these issues. Sustainable design, for example, aims to develop products that do not threat the environment and to explore the potential of sustainable development. Inclusive design aims to develop products for the minorities, who have long been ignored. User-centred design aims to develop products that are better aligned to their target

population. In a similar line, it can be said that emotional design aims to enhance positive and pleasurable experiences in users. Hence, research in this area is an opportunity for design because it can help understand how to offer value to users. This aligns well with the aspirations of many designers, who have a tendency to deliver benefits to users.

The framework of user experience

The framework of user experience was developed early in this research project. The results from the empirical studies undertaken after the development of the framework have helped reflect on a number of its aspects.

Identifying the aggregates of user experience was a complex task. In many cases we have had to infer them based on the explanations of scholars. There are even cases in which possible aggregates emerged and were not considered as not sufficiently supported. For example, Varela et al (1991 p.68) argue that in user experience there is an intention from the person towards the object, while Hassenzahl (2010) refers to goals. We have now developed the view that intention should be listed as one of the aggregates of user experience. The idea of intention has its roots in phenomenology. Heidegger, for example, explains that entities (products, in the context of this research) are not there simply for theoretical inspection. Rather, we do things with them, pick them up, discard them, manipulate them, put them to use (in Macann, 2005 p. 73). In other words people have intentions when interacting with products. This is relevant to user experience because pleasant experiences with products are aligned with users' intentions, goals or motivations.

The results of the study of great products support the idea to have an intentional aggregate, see *Figure 7.1* for an updated version of the framework. For example, the difference between pragmatic and significant experiences was made, among others, based on the intentions of users. User's intention also emerged when emotions were studied. Appraisal theory acknowledges the intention through the motivation appraisal. Motivation is related to the user's will in a particular situation. In addition to this appraisal structure, when investigating the four positive emotions we realised that although some emotions involved a similar set of thought-action tendencies, the motivation was different.

7.3 *Contributions*

The main contributions of this thesis are reported next:

- A general framework of user experience was developed based on an extensive review of the literature. The development of the framework has strengthened existing knowledge in the field of user experience by connecting sparse concepts. The framework identifies six aggregates of user experience, namely *subjective*, *conscious*, *intentional*, *emotional*, *interconnected* and *dynamic*, and presents four constituent elements of user experience, namely the *user*, the *interaction*, the *artefact*, and the *context*. The framework can be used as a platform of discussion by scholars investigating user experience. Designers can also benefit from it as they can use it to guide decision making in the design process.
- Two types of pleasant experiences were identified as a result of user interaction with great products, namely *pragmatic* and *significant*. This typology adds to previous work by taking a broad view on experience, which has given special attention to emotions and needs. Pragmatic and significant experiences were explained in detail including the emotions elicited by the products that enhanced those experiences and the needs fulfilled.
- New knowledge about the preference of experience by users and the preference of elicitation by designers of a set of twenty-five positive emotions was developed. The underlying reasons for preferring the emotions were also reported and compared between the two groups. In design research there are few studies that have contrasted the perspectives of users and designers. The results of this study can be used to guide designers in the selection of the positive emotions that they can evoke by product design. Scholars can also use this information to investigate in detail some of the most preferred emotions and help designers deal with the difficult task of designing emotions.
- A set of twenty-five positive emotions was classified into *exciting*, *median arousal* and *calm* to characterise their arousal dimension. The same set was also studied in terms of its pleasantness and the emotions were classified into *very pleasant*, *mildly pleasant* and *pleasant*.

- A novel set-up to study emotions was implemented and tested with positive results. This set-up is a new option for design researchers to capture both recall and immediate experiences of emotions elicited during human-product interactions. Future studies can employ this set-up to investigate other positive emotions.
- New and detailed characterisations of anticipation, confidence, inspiration and sympathy were developed investigating user experience with products. These characterisations differ from previous work because we identified the involved appraisal structures, thought action tendencies, and eliciting conditions for each of the four studied emotions.
- Design tools to elicit anticipation, confidence and inspiration were developed and tested as part of a three-step design process. The tools provide relevant information about emotions that can be contextualised in relation to the project that designers are working on. This approach to support the elicitation of positive emotions is new compared to previous work as it is based on building a generic knowledge base rather than creating it as part of a specific design project. In addition, aspects that explain designers' positive evaluation of the tools were identified. In particular, the research found that the tools are useful to develop new ideas and that designers can use them to contrast their personal understanding of emotions.

7.4 *Limitations*

The specific limitations of the studies undertaken in this project have already been reported in the previous Chapters. Hence, this section addresses the general limitations of the research.

The framework of user experience was not tested by designers to evaluate its usefulness to support design work. The framework was only employed to study how users experience great products.

Almost all the studies carried out in this research project used qualitative methods and relied upon small populations. Although the objectives of each study were

accomplished, there is a limitation regarding the generalisation of the results. It is important to mention that the data collection methods used in this research project were defined based on its philosophical stand, i.e. social constructivism. This stand was selected because we wanted to understand people's reality in relation to pleasant experiences. Even though each study relied upon small populations it worth highlighting that this research is based on the views of 124 users and 32 designers.

This research project relied extensively on self-reported data. This type of data has limitations because it is difficult to verify. For example, emotions could also be verified by behavioural reactions. However, the literature on emotions has reported that there are not obvious behavioural reactions for some positive emotions. In addition, self-reported data is influenced by various biases. The most notable ones are information recall which is subject to selective memory (i.e. the focus is placed only on the relevant aspects for the participant) and attribution (i.e. negative aspects and outcomes are attributed to external agents and positive aspects to the participants). Although we tried to address memory biases, it is expected that we may have succeeded only at decreasing them.

The results of this research project are strongly tied to the place in which the studies were carried out, and this should be noted as a limitation. Despite the fact that in many of the studies participants were from different countries, the results are still culture-dependant. The characteristics of the participants can be considered representative of the multi-cultural environment of London. In addition, the characteristics of the population studied are a limitation of this work. This research focused on a young age group. Previous research has shown that there are significant differences between age groups in the context of pleasure and product design (Porter et al, 2008).

The research carried out to create the detailed profiles of emotions is based on four positive emotions. Only this limited number of emotions could be studied within the time and funding constraints posed by the doctoral programme.

This research project focused on pleasant experiences. Hence, unpleasant experiences, a significant component of human experiences, were not investigated. This may be considered a limitation because research in user experience aims to understand the whole human experience with products. It is clear that products trigger not only positive emotions but also negative ones. It remains unclear if users

consciously choose to interact with products that trigger negative or unpleasant experiences. It can be that users interact with unpleasant products because they do not have an alternative. Regarding the design of unpleasant experiences, we can imagine several reasons to design them, for example, as a deterrent to perform specific actions. Designers can also follow their creative needs to question current design tendencies. However, it seems difficult that industry may strategically launch on the market products aiming to enhance unpleasant experiences in users.

7.5 *Future research*

There are various opportunities for future research in relation to the work undertaken in this project. Some opportunities are to provide a deeper understanding of issues identified in this project and others to open new lines of investigation.

More research is needed to test the usefulness of the framework of user experience. For example, future studies can investigate its use to train designers in the field of user experience and guide them to identify the most relevant elements to address depending on the problem at hand. In addition, it can be explored if there are other constituent elements or aggregates that should be integrated into the framework.

Characterising pleasant experiences, we suggested the term significant experiences for those that allow users to perform activities involving self-expression, growth, and creation. However, there are still aspects that are unclear in significant experience. For example, it is unknown if they have an impact on user's well-being. We have also suggested some ideas to design significant experiences and pleasant ones. Future studies can either explore the concept of significant experiences in more detail, with larger populations, or test some of the strategies suggested to design pleasant experiences.

This research project studied in depth four positive emotions. More research is needed to develop detailed profiles of a larger group of positive emotions. Future research could extend the study of positive emotions. For instance, the most pleasant emotions that were identified in this study are: joy, satisfaction, desire, inspiration, relief, confidence, fascination, euphoria, energetic, love, and relaxed. At the moment

there is little knowledge about most of these emotions, and this would be important to develop a complete approach to design for pleasant experiences. There are also potential benefits of implementing and improving the research set-up that was used to study emotions. For example, it can be improved by including more appraisal structures. These can be selected based on their relevance to product design, e.g. the appraisal structure of novelty.

An issue that was not addressed in this research project but it is important to deal with is the influence of culture on user experience. For example, future studies may investigate positive emotions in relationship to users' preference and frequency of experience in different cultures. It is important to identify if these issues are culture dependent or not. It can also be interesting to investigate if great products in different cultures can be categorised as pragmatic or significant, or they lead to other experiences. Similarly, studying positive emotions with different age groups can help identify the differences or similarities in the preference of experience. It could also be useful to explore if the triggers of emotions vary across age groups.

More research could also be undertaken to understand the role of activities in user experience. Activities are critical to user experience because they can be linked to users' motivations or intentions. In addition, there are some activities that are more pleasant than others. Activities, however, are performed with the help of products. There is a lot of unknown in the relationship between activities and products, e.g. when performing a preferred activity, how much the product adds to the experience.

Future research could explore ways to increase the power of pleasant experiences. In our view this relies upon the right match between experience or emotion and product or service. We have trained designers to develop products that elicit specific emotions, but this does not mean that they are well-matched. Detecting situations in which by eliciting emotions such as confidence has the potential of changing that situation for good seems to have a stronger impact on pleasant experiences. Thus, it is interesting to explore ways to make the right connections between experiences and products or services.

There are different levels of pleasure in human-product interactions. It is, therefore, important to understand under which circumstances is relevant to design for very pleasant, mildly pleasant and pleasant experiences.

This research focused on the emotional aggregate of pleasant experience. How-

ever, pleasant experiences could also be studied based on other aspects such as the needs fulfilled by products (see Hassenzahl et al, 2010) and the values of users. With respect to the former, future research could investigate how the fulfilment of a need leads to a pleasant experience and how that information could be used to design products. For example, by understanding how autonomy is fulfilled in human-product interactions and how designers can create experiences that stimulate this need in users. In relation to the latter, future research could aim to identify which values are involved in human-product interactions and their impact on the experience of products.

7.6 *Conclusions*

The current economic, societal, and environmental situation poses important challenges for design. Dealing with these contemporary issues demand a shift from traditional skills to new research-based approaches to design. In this context design research is an alternative and can provide designers with knowledge, methods, and tools to design more effectively and for today's needs. This is in contrast to the master-apprenticeship approach that many schools of design rely upon. In this project we have investigated user experience with the intent to develop knowledge, methods and tools to support designers. In particular, we have aimed to characterise pleasant experiences and to design them. By providing designers with detailed knowledge about pleasant experiences and positive emotions we believe to have contributed to making the challenge of designing for experiences more feasible.

Throughout this journey we have learnt that user experience is a complex subject to investigate as it is influenced by many factors. We found that user experience is determined by the user, the interaction, the artefact, and the context. More so, each of these elements embodies a range of additional sub-elements. Despite the richness of elements involved in user experience, its main focus is the human being.

To fully understand user experience and design it there is a need to employ multidisciplinary approaches. In this project in order to understand user experience we relied on knowledge from psychology, sociology, engineering, and design. The

project took a social constructivist view on knowledge development. After creating a foundation on user experience, pleasant experiences were studied in detail using empirical methods and the knowledge developed was tested in a design situation. The primary means of studying the phenomena of pleasant experiences was self-reporting methods, which despite their limitations provided valuable insights. The direct relationship, which emotions have with pleasant experiences in contrast to needs justified the focus on emotions. To develop rich knowledge of emotions in the context of user experience required the study of appraisal structures and thought-action tendencies. Investigating these aspects was fundamental to create detailed profiles of anticipation, confidence, inspiration and sympathy. Equally relevant, the study of the products that users acknowledged as elicitors of specific emotions was central to identifying their eliciting conditions. Overall, the results of the project make us conclude that the methodological approach was suitable to understand pleasant experiences.

Experiences were classified based on a holistic perspective which took in consideration the needs, the emotions, and the intentions of users together with the context, and the interaction. This approach enabled to develop detail explanations of pleasant experiences distinguishing them between pragmatic and significant. Experiences were also classified based on their arousal dimension. This is a more objective classification in comparison to the pragmatic and significant one. However, a limitation is that aspects such as the context or the needs were not well understood. This is because the driver of exciting, median arousal, and calm experiences is strongly tied to a human physical condition, and therefore other aspects are not considered.

Users and designers were able to identify relevant positive emotions for their product choice or the products that they have to design. There is an alignment in the preference of the positive emotions that users and designers reported. This alignment indicates that a pleasant experience is a shared goal for designers and users in terms of designing and experiencing it respectively.

Designers reported a need for a better understanding of pleasant experiences. To fill in this gap they were introduced to knowledge on positive emotions in the form of design tools. The tools were found to help the designers fulfil the task of creating concepts and making conscious decisions in relation to eliciting a specific

emotion. They also reported that the tools helped them contrast the knowledge provided with their personal understanding of the emotion and empathise more with users. These benefits showed that emotions can be a means to stimulate the shift from products to users, which is a key aim of user experience.

After a long period of time in which emotions were neglected by research due to their 'irrationality', this research has investigated them and contributed to the body of knowledge that is growing in this field. By studying the relevance of emotions in pleasant experiences and developing knowledge to enhance them we have shown that emotions deserve attention due to the key role that they play in human-product interactions.

Pleasure could be seen as a superficial issue in design. It, however, has a significant role in daily life. Pleasure is also acknowledged as a universal need. For these reasons we believe that studying pleasure is important, and it requires systematic and scientific investigation. We consider that this research project represents a step in that direction.

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Glossary of terms

***

Agent: A person or thing that takes an active role or produces a specified effect.

Aggregate of user experience: This term refers to a property or structure of user experience.

Appraisal structure: This term refers to an element internal or external to an individual, that activates and impact on the emotional experience.

Appraisal theme: This is a summary appraisal statement that reflects the overall personal relational meaning evoked by an emotion.

Appraisal theory: This is a theory claiming that emotions are elicited by evaluations (appraisals) of events and situations.

Arousal of an emotion: This term characterises the bodily symptoms of an emotion.

Constituent element of user experience: This term refers to components of user experience.

Experience-oriented approach to design: It focuses on human hopes, fears, dreams, feelings, and self-image, without neglecting physical and cognitive capabilities.

Pleasantness of an emotion: This term characterises the hedonic valence of an emotion.

Positive emotion: This term embodies the goodness of an emotional state, which generally represents genuine benefits for a person.

Pragmatic experience: This term refers to the experience that a person gets when a product works very well.

Significant experience: This term refers to an experience that emphasizes the importance of meaningful actions by a developing self in complex and unfolding relationships. These actions or activities offer benefits for users including possibilities for growth and acknowledge the active role that users have in human-product interaction. In addition, this experience is significant because users reaffirm themselves through the activities undertaken and the products involved.

Thought-action tendency: This term characterises behavioural and cognitive aspects of the individual experiencing an emotion.

Tool-oriented approach to design: It focuses on human physical and cognitive capabilities.

Trigger: This term refers to an event that is the cause of a particular emotion.

Appendix 1

How users experience great products

- For how long have you used the product for?
- Did you buy this product?
- Why this is a great product?
- When did you acknowledge that this product was a great product? (right away, after some days, some months)
- Did your evaluation of great product evolved or changed over time? How?
- Did you have a previous impression of the product before buying or using it? What was this previous impression?
- How would you describe the experience that you have had with this product? (positive, fun, playful)
- Why do you describe it in this way? Does this influence your judgment of great product?
- Do you think the product works well? Why? Does this influence your judgment of great product?
- Does using this product require specific skills from you? Which ones?
- Do you experience the product as difficult or easy to use? Why?
- Do you experience the product as attractive? Why?
- Do you experience something new from this product? In which way?
- Does this product trigger any of your senses? Which ones? (Sight, Hearing, Taste, Smell, and, Touch)
- Are there characteristics of the interaction that you like? Characteristics that you perceive when you are touching the object: textures, weight, pushing, pulling, tactile qualities
- Does the product have a special meaning for you?
- Does the product reflect something about you? What is this?
- Have you personalized this product? How?
- Where do you regularly use the product?
- Do you think that the product works well in different environments (e.g. indoors versus outdoors)?
- Do you use the product for leisure or work?

- Have you recommended this product to someone else? To whom and why?
- Do you think that your evaluation of great products depends on the product, on yourself or both? Why?
- Are you planning to use this product for a long time?
- If you need to replace it for any particular reason, what do you think will happen to this product?
- Having a great product will influence, in whatever aspect, your future product choice of a similar product? How?

Appendix 2

Interview

Activity 1. Frequency - Users

- Can you give us some examples of products or situations in which you have experienced these emotions?
- How intense are these emotions?
- Are there specific attributes of the products that elicit these emotions, e.g. its function, its appearance, etc.?
- Are there specific situations that elicit those emotions apart from the product?
- What is your opinion of products that elicit these emotions?
- Why do you think these emotions are not frequently experienced through products?
- Do you think that designers try to elicit these emotions through durable products? Why?

Activity 2. Preference - Users

- Why these emotions are important for you to be experienced through durable products?
- Have you experienced these emotions with existing products
- If you have to choose one, which one will you choose (From the pile I would like to...)? why?
- Why you don't want to experience these emotions?
- Do you think that designers can elicit these emotions through durable products?
- Do you think that all these are emotions, or these reflect other affective states? If yes take out the names that you could not call them emotions

Activity 1. Preference - Designers

- Why do you want to elicit these emotions through your designs?
- Have you intentionally tried to elicit these emotions in your designs?
- Are you familiar with a design strategy to elicit specific emotions through durable products?

- If you have to choose one, which one will you choose (From the pile I would like to)? why?
- Why you don't want to elicit these emotions in your designs?
- Do you think that some of these emotions are linked to specific attributes of the product, e.g. its function, aesthetics, etc.
- Do you think that these emotions can be experienced by people through products?

Activity 2. Difficultness - Designers

- Why do you think these emotions are difficult to design?
- Why do you think these emotions are easy to design?
- What do you need to design for emotions? for this I mean trying to elicit specific emotions?
- Do you think that some of these emotions last longer than others?
- Do you think that some of these emotions are experienced at specific moments of the human-product relationship?

Closing questions

- Do you think that all these are emotions, or these reflect other affective states? If yes take out the names that you could not call them emotions.
- Are you familiar with any theory for designing emotions through products?

Appendix 3

Mean scores per group users and designers

	Users					Designers				
		Frequency		Preference			Preference		Difficultness	
Emotion	**N**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Admiration	14	3.21	1.05	3.21	1.25	14	3.14	1.17	3.36	1.08
Amusement	15	3.87	1.19	4.13	0.99	14	3.71	1.07	2.29	1.44
Anticipation	15	3.20	1.37	3.13	1.46	14	2.71	1.38	2.43	1.40
Confidence	15	3.67	1.11	4.53	1.06	14	4.21	1.12	2.64	1.08
Curiosity	15	3.47	1.13	3.80	0.77	14	4.36	0.74	2.93	1.27
Desire	14	3.93	1.14	3.21	1.53	14	3.29	1.33	3.21	1.31
Dreamy	12	2.50	1.51	2.75	1.36	14	3.29	1.33	3.29	1.49
Enchantment	13	2.69	1.49	3.00	1.00	12	3.75	1.22	3.75	1.14
Energetic	14	2.71	1.07	3.36	0.93	14	3.00	1.30	3.21	1.31
Euphoria	12	2.00	1.04	3.00	1.04	14	2.64	1.15	3.79	1.58
Fascination	15	3.33	1.05	3.60	0.99	14	4.07	1.14	3.14	1.46
Hope	15	2.47	1.41	2.80	1.01	14	3.14	1.17	4.21	0.97
Inspiration	15	3.53	0.99	4.60	0.63	14	4.21	1.05	3.71	1.07
Joy	15	4.00	1.07	4.40	0.74	14	4.29	0.99	3.36	1.15
Kindness	15	2.27	1.28	2.53	1.36	14	2.86	1.46	4.14	1.10
Love	15	2.73	1.33	2.93	1.44	14	2.86	1.17	4.50	0.85
Lust	13	1.69	0.85	1.46	0.66	12	1.92	1.08	3.17	1.40
Pride	15	2.80	1.32	2.80	1.42	14	4.07	1.07	3.29	1.38
Relaxed	15	3.67	1.05	4.07	0.70	14	3.71	1.38	3.07	1.21
Relief	15	3.27	1.22	3.33	1.40	14	3.43	1.50	2.57	1.28
Respect	15	3.33	1.23	3.60	1.24	14	3.64	1.15	3.36	1.22
Satisfaction	15	4.13	0.74	4.93	0.26	14	4.07	1.14	2.50	0.94
Surprise	15	2.60	0.99	3.40	0.99	14	4.21	1.42	2.43	1.50
Sympathy	15	2.27	1.28	1.87	1.19	14	3.29	1.27	3.50	1.16
Worship	12	1.75	0.96	1.50	0.90	12	1.17	0.39	4.33	0.98

Appendix 4

Questionnaire to assess emotions based on arousal

Sex: Male Female Native Language: _____

Nationality: _____ Ocupation: _____ Age: _____

How pleasant and intense (Calm/excited) are the following emotions in relation to durable products that you are familiar with?

Confidence

Pleasant ☐ ☐ ☐ ☐ ☐ Very Pleasant

Calm ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Excited

Desire

Pleasant ☐ ☐ ☐ ☐ ☐ Very Pleasant

Calm ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Excited

Relaxed

Pleasant ☐ ☐ ☐ ☐ ☐ Very Pleasant

Calm ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Excited

Worship

Pleasant ☐ ☐ ☐ ☐ ☐ Very Pleasant

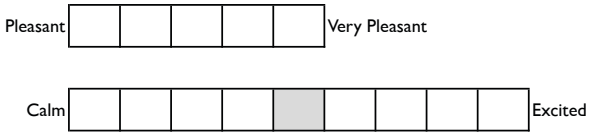
Calm ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Excited

Enchantment

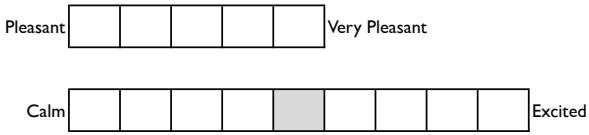
Pleasant ☐ ☐ ☐ ☐ ☐ Very Pleasant

Calm ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Excited

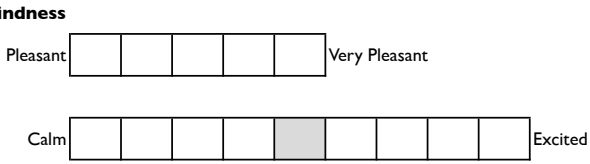
Anticipation



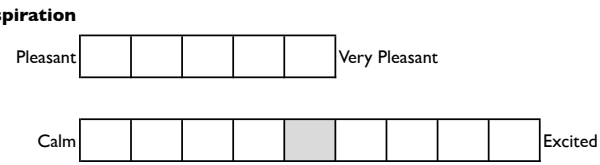
Courage



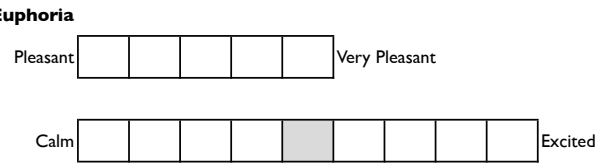
Kindness



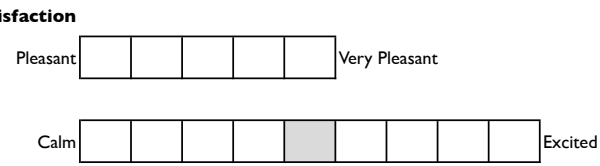
Inspiration



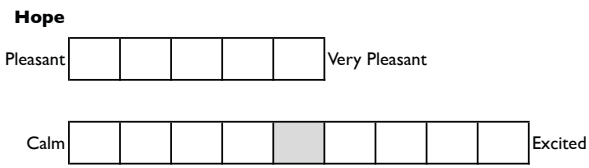
Euphoria



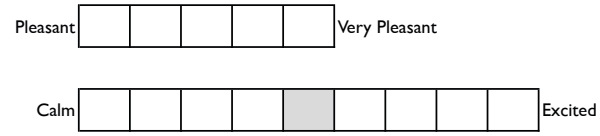
Satisfaction



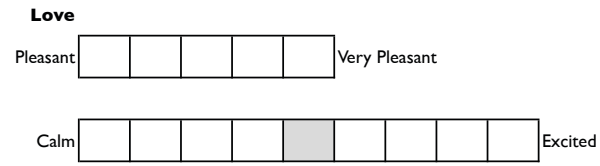
Hope



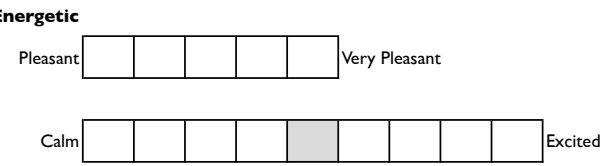
Admiration



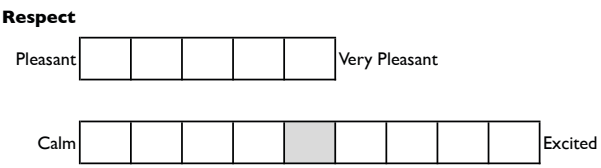
Love



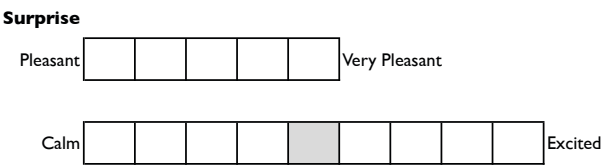
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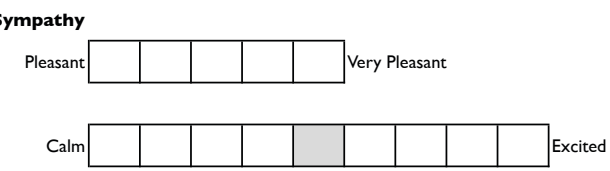
Respect



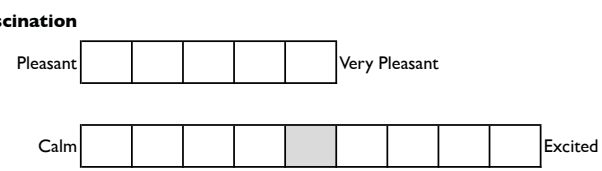
Surprise



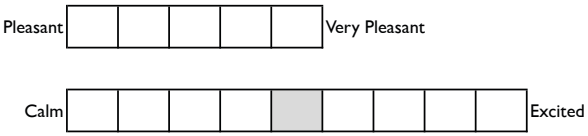
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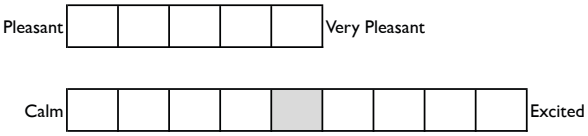
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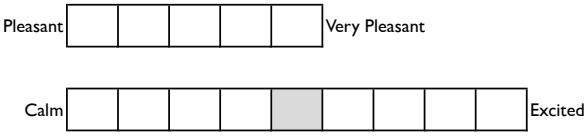
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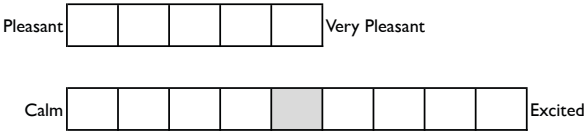
Amusement



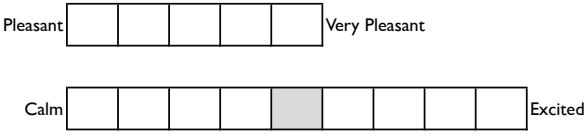
Lust



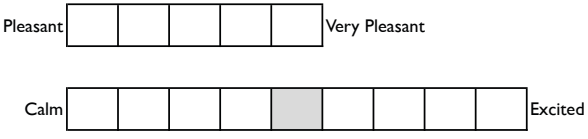
Dreamy



Pride



Joy



Appendix 5

Written instructions to assess emotions based on arousal and pleasantness

We will use the example of the emotion *curiosity* to show how you can use the questionnaire.

I feel *curiosity* with products in general. The other day I was at a store and a hoover draw my attention. I felt curiosity about it. I think that experiencing curiosity through products is a **very pleasant** emotion, thus I cross the closest box to it. When I feel curiosity I feel a high **arousal** (excitement) because I want to investigate more. I report this on the box towards excited.

Curiosity

Pleasant					**X**	Very Pleasant			
Calm					**Neutral**			X	Excited

If you are not familiar with some of the emotions do not hesitate to ask.

Appendix 6

Interview for Activity A: bringing your own products

The interview is organised in six topics.

- About the product
  - For how long have you used the products?
  - Did you buy these products? Why? (Motivation)
- About the overall perception of products
  - Considering your overall evaluation of the product, how good or bad are these products for you? Why?
  - To what extend experiencing 'the emotion' influences your evaluation of good or bad products?
- About the activity itself
  - How easy or difficult was for you to write a description of the assigned emotion?
- About the product choice
  - Can you tell me what it is for you 'the emotion'?
  - Can you explain why these products elicit 'the emotion' in you?
  - Do you find these products attractive?
  - Are there characteristics of the interaction that you like? Characteristics that you perceive when you are touching the object: textures, weight, pushing, pulling, tactile qualities
  - Do these products work well?
  - Do the products have a special meaning for you?
  - To what extend do you think these characteristics (appearance, meaning, interaction, and function) trigger the emotion in you?
  - Are these novel products for you? In which way? (Novelty)
  - Using these products requires specific skills from you? Which ones? (Coping potential)
  - Do these two products make you feel 'the emotion' in the same way? If not, can you describe either the differences or similarities?
  - Experiencing the emotion through products is important or not important for you? Why?

- After experiencing the emotion with the product, have you experienced it again with it?
- How often do you experience this emotion with the product
- Is there a negative aspect about feeling 'the emotion' through products?

▪ About the appraisal conditions that elicited the emotion

In this section I will show you some cards that might be related to the emotion. Please choose the card that you associate with the emotion. You can choose as many as you want. To start this part of the study: can you tell me a recent example of when you were feeling 'the emotion' with the product?

Appraisal evaluations (Questions to be asked while they choose the cards)

Motivation

- Were you trying to accomplish a goal? Did you succeed?
- Were there involve desirable outcomes?

Expectedness

- Were expectations involved that came true?

Situational

- Why do you think that somebody/the circumstances were responsible?
- Somebody can feel ashamed because they lie; they are responsible to trigger shame. Do you feel responsible to trigger 'the emotion'? why? (Self-agency)

Controllability

- Could you affect the situation in any way?

Predictability

- Were you usually right at your predictions?

Effort

- Do you have to overcome obstacles?

Action tendencies

I will give you some cards related to action tendencies in general. Please choose those that you associate with the emotion. You can choose as many items as you want.

▪ About the current definition

To conclude this activity we will present you a definition of 'the emotion' subject of the interview.

- Do you think that this definition reflects your own feeling about the emotion? Would you like to add something to this definition?

Appendix 7

Interview for Activity B: ranking eight products

- About the emotion
  - Can you tell me what is it for you the emotion? How does it feel?
- About the activity itself
  - Was it easy or difficult for you to categorise the products based on 'the emotion'?
  - Did you have enough product options to choose from?
  - Are you familiar with these products?
- About the product choice
  - Why did you pick up these products?
  - Are these novel products for you? In which way? (novelty)
  - Do you find these products attractive? What about the other bit?
  - Products that elicit 'the emotion' are attractive or not attractive?
  - Based on your first impression, do you think that these products work well? Products that elicit 'the emotion' work well?
  - Products that are challenging/ not challenging to use elicit 'the emotion' trigger the emotion? (Coping potential)
  - About physical interaction, are there any specific characteristic that catch your attention? Does it contribute to experience 'the emotion'?
  - Do these products make you feel 'the emotion' in the same way? If not, can you describe either the differences or similarities?
  - Why these products do not elicit the emotion in you?
  - Experiencing the emotion through products is important or not important for you? Why?
  - After experiencing the emotion with the product, do you think you will experience it again with the same product?
  - Is there a negative aspect about feeling 'the emotion' through products?
- About the appraisal conditions that elicited the emotion

In this section I will show you some cards that might be related to the emotion. Please choose the card that you associate with the emotion. You can choose more than one item. When you feel the emotion:

Appraisal evaluations (Questions to be asked while they choose the cards)

Motivation

- Were you trying to accomplish a goal? Did you succeed?
- Were there involve desirable outcomes?

Expectedness

- Were expectations involved that came true?

Situational

- Why do you think that somebody/the circumstances were responsible?
- Somebody can feel ashamed because they lie; they are responsible to trigger shame. Do you feel responsible to trigger 'the emotion'? why? (Self-agency)

Controllability

- Could you affect the situation in any way?

Predictability

- Were you usually right at your predictions?

Effort

- Do you have to overcome obstacles?

Action tendencies

I will give you some cards related to action tendencies in general. Please choose those that you associate with the emotion. You can choose as many items as you want.

- About the current definition

To conclude this activity we will present you a definition of 'the emotion' subject of the interview.

- Do you think that this definition reflects your own feeling about the emotion? Why?

Appendix 8

Profile of emotions

Confidence

1. Reasons

People experience Confidence with products when:

– The person has dealt with a difficult situation with the help of a product, as in the case of solving a complex puzzle or improving their sketching skills with a pen.

– They delivers good functionality, therefore, products are reliable.

– The person is familiar with the product in terms of use, interaction, and appearance.

– The person can reflect their identity through them, e.g. I feel confident when I wear my heels.

– The person is in control of the situation, e.g. in a dark environment a wind-up lamp gives people them access to light, which makes them feel they are in control of the situation.

– They feel and look solid, robust, of good quality, and are easy to use.

On the other hand, people do not experience Confidence when they do not know what the outcome is going to be, e.g. playing with Lego bricks means that they do not know what result is going to be. Novelty seems to diminish people's Confidence, possibly because novel things are unknown. People do not experience this emotion when the product feels fragile and cheap, when it gives the impression that it is going to fail soon after its purchase.

The temporal aspect of Confidence is the here and now, experiencing it is an immediate event, e.g. con- firming expectations or successfully completing a challenging task. Once that people have experienced Confidence with products, it will last until something unexpected and wrong occurs with it.

2. Appraisal structures

When experiencing Confidence through products, the situation is consistent with what people want. Under the given situation it is expected to experience the emotion. The emotion is triggered by oneself, however, when self-expression is involved, e.g. in a social context, people can assign agency to the circumstances. Experiencing this emotion increases people's self-esteem. People have the power to control and direct the situation. Regarding predictability they know what is going to happen next, there is situational certainty i.e. confirming expectations. Mental and physical effort are involved when experiencing this emotion. However, it can also be the case that no effort is involved, e.g. when they are very familiar with the product, the more familiar the less effort. High coping potential is involved when experiencing Confidence, e.g. if they accomplished a challenging task a person gains Confidence.

3. Thought-action tendencies

When people experience Confidence, they feel reassured, there is certainty involved based on the per- son's performance or in the circumstances. They are Free from doubt. People also savour the period in which they feel confident. They also maintain a product that makes them feel Confidence.

4. Statements

Confidence is experienced when a person is certain that they are capable to do what they want to do. This usually happens when people successfully cope with a task, or activity in which their skills are tested. In this case, products support the person to fulfil those activities or tasks. This idea is also related to certain- ty, people have an idea of what is going to happen, and when it does happen they confirm expectations and experience Confidence. Certainty may also occur because of simple repetition of the task confirming that the product works well, and by doing so, they consolidate the idea of Confidence.

Confidence is also experienced when a person expresses their identity through the products they own. This includes the social aspect of Confidence, when people want to look nice, or express their preferences through the use of specific products, like shoes, watches, or perfumes. People's possessions are a contributor to and reflection of our identities.

Inspiration

1. Reasons

People experience Inspiration through products when:

– The person does meaningful activities with the help of their products. Generally speaking, these activities allow them to grow or show them new possibilities, e.g. reading a novel.

– The person encounters a smart solution into a product; solutions that are ingenious and original.

– The person finds beauty in how the product works, as well as, in its appearance.

– They offer people possibilities to create, as in the case of a sewing machine or a camera. Inspiration seems related to doing something out of that Inspiration, a spark of creativity.

On the other hand, people do not experience Inspiration with products that are irrelevant in their lives, that are conventional, or that do not offer them opportunities for self-expression and creation.

The temporal aspect of Inspiration is the here and now, once that the person is touched by the external event, they can feel inspired and react accordingly, thinking about the situation or doing something regarding to that situation. However, it is also related to the future, in the sense that by feeling inspired they can change their (or other's) future; in other words to improve it. When experiencing Inspiration there is a positive future expectancy involved.

2. Appraisal structures

When people experience Inspiration, the situation is consistent with what they want, and it is an unexpected event. For agency, people assigned it to the circumstances or other people as responsible for triggering the emotion. However, the person is touched by that external event, it is important for them. People do increase their self-esteem when experiencing Inspiration. They have the power to influence or direct the situation, however, they do not know what is going to happen next. When experiencing Inspiration mental and physical effort are required. For coping potential, it was linked as an added value, e.g. when creating something new participants may need to use their skills to pursuit an idea or make it concrete.

3. Thought-action tendencies

When experiencing Inspiration people pay attention to the product, event, or person. They do notice the object. They also identify with the product, event, or person that triggers this emotion and reflect on or think deeply about them. Additionally people want to get their hands on the product/idea that triggered the emotion. As a result of being inspired they tend to create something new. This 'new' creation can be tangible, like doodling, or intangible, like elaborating on an idea. They also tend to open up about the situation in which they are in when experiencing Inspiration. This may happen because they see new opportunities out of the event/product/person that triggered Inspiration.

4. Statements

Inspiration is experienced when a person unexpectedly identifies with an idea, insight or object that shows them possibilities to grow and flourish. People seek to grow and develop, and Inspiration is linked to this. For example, through an e-reader people can gain knowledge and stimulate their imagination but with- out the hassle of having many books that also take physical space. In addition, people can experience Inspiration when an object shows them new possibilities to solve a particular issue, for example, the e- reader in itself offer new possibilities for reading such as sharing comments with other people over the internet. In a way the e-reader helps people improve their current situation and create a new one.

Appendix 9

Design Ingredients

Designing CONFIDENCE

Confidence is experienced when:
1) a person is certain that they are capable to do what they want to do.
2) a person expresses their identity through the products they own.

Appraisal structure:

When experiencing Confidence:
- The situation is consistent with what people want.
- Under the reported situation it was expected to experience confidence.
- It is triggered by oneself.
- People have the power to direct the situation.
- Predictability is involved, i.e. confirming people's expectations.
- Mental and physical effort are involved.
- There is high coping potential involved, e.g. by using people's skills or knowledge to handle the situation.

Thought-action tendencies:



When experiencing Confidence people are:
- *Reassured* about the situation/product.
- They *savour* experiencing the emotion.
- They reported that they *maintain* a product
that triggers confidence.

SKILLS

• Consider how people's skills can be used in the design solution, e.g. by promoting user's skill acquisition.

• Create challenging or complex situations that people can overcome.

• Give the control to the user over the situation.

• Give autonomy and independency to the user.

FAMILIARITY

• Create solutions that are familiar in appearance, e.g. by using a well-known appearance.

• Use well-known interaction styles, e.g. typing.

COMFORT

• Create solutions that make people feel comfortable.

• Create solutions that embody people's knowledge by considering their social and cultural background.

• Look for solutions that make people feel safe and secure.

• Create solutions that work well.

CONSISTENCY

• Make sure that while using the product the user will know what is going to happen next.

• Seek consistency between the look and feel of the product, e.g. it looks and feels solid.

• Stimulate users to express themselves.

• Allow users to personalise the designed solution.

Designing INSPIRATION

Inspiration is experienced when a person unexpectedly identifies with an idea, insight or object that shows them possibilities to grow and flourish.

Appraisal structure:



When experiencing Inspiration:
- The situation is consistent with what people want.
- Under the reported situation it was unexpected to experience inspiration.
- It is triggered by circumstances.
- It increases self-esteem.
- People have the power to control the situation, however, the outcome is unpredictable.
- Mental effort is involved.
- There is coping potential involved e.g. by using skill and knowledge to handle the situation.

Thought-action tendencies:

When experiencing Inspiration people:
- *Identify with* the situation/product.
- *Pay attention* to the situation/ product.
- They *get their hands on* the product.
- They *reflect on* the situation/product.
- They *create* as a result of feeling inspired
- They *open up* about possibilities.



CONNECTION

• Create unexpected solutions that connect with the user. The connection can be regarding enjoyable activities such as reading, cooking, or cycling.

• Explore solutions that 'connect' with the user in different levels, e.g. ideological, spiritual, or professional.

FLOURISH

• Seek solutions that help people grow and flourish.

• Seek solutions that trigger people's imagination.

• Seek solutions that improve people's current situation.

• Consider how to involve a future positive expectancy.

POSSIBILITIES

• Challenge users by presenting them new possibilities, e.g. a lamp that uses a new and sustainable source of energy.

• Stimulate people to reflect about an interesting topic, e.g. people can reflect on a product when it is manufactured with a new process.

• Stimulate opportunities for self-expression and creation.

• Create solutions that are flexible in its outcome, e.g. Lego bricks are a source of several possibilities.

GRACE

• Design solutions that allow people create beauty.

• Seek smart solutions, that are ingenious and original.

• Seek solutions that allow users to focus on their source of inspiration, e.g. by creating transparent interactions.

• Create beautiful products in terms of appearance and interaction.

Appendix 10

Questionnaire 1 - Workshop

Name: _____ Age: _____

Sex: Male Female Nationality: _____

Undergraduate degree in: _____ Years of experience in design: _____

Postgraduate studies in: _____

Please rate the following statements. Remember there are no right or wrong answers

Please tell us what you know about designing for emotions:	I strongly disagree	I disagree	Neither agree nor disagree	I agree	I strongly agree
I have theoretical knowledge about design for emotions					
I have used a specific design methodology to design for emotions in the past					
I rely on self-experimentation when designing for emotions					
I design aiming to evoke specific emotions					
I know what emotions are relevant for designing					
I have worked with users to explore what emotions they experience with products					
I am not familiar with the field of designing for emotions					

Why would you design for emotions?	I strongly disagree	I disagree	Neither agree nor disagree	I agree	I strongly agree
To have better employability					
To improve people's well-being					
To explore a new aspect of design that I am interested at					
To design more strategically					
To acknowledge that I am designing for other human being					
To become a better designer					
To design richer experiences					
To enable users to interact better with products					
To design products that may have better opportunities to succeed on the market					

Other reasons, please write them down in the following box:

Please write the emotions that you think are relevant for design

Write as many as you want:

Appendix 11

Questionnaire 2 - Workshop

Name: _____ Age: _____

Sex: Male Female Assigned Emotion: _____

Please rate the following statements about the used process and tools to design for emotions

	I strongly disagree	I disagree	Neither agree nor disagree	I agree	I strongly agree
About the overall design process (Selecting the emotion/getting information about it/creating design solutions)					
I think that the overall design process taught in this workshop is useful for designing emotions					
About the design solution					
I am disappointed with my design solution					
I feel that my solution fulfils the aim of evoking the intended emotion					
My solution resulted from the design process and used tools					
I like my design solution					
About the design task					
I think that the design task was clear					
I think that the design task was difficult to complete					
I had enough time to complete the design task					
I had the right conditions to complete the design task					
About Tool A: Profile of the emotion					
It is useful because it is clear to understand					
It is useful because it offers new knowledge of the emotion					
It is useful because it gives a structured overview of the emotion					
It is useful because I have space to explore my ideas					
It is useful because I can use it for future projects					
It is useful because it gives ideas that I can further develop					
It is useful because it guides my design process					
It is useful because it is effective to develop a design solution					
It is useful because it provides the information that is needed to design					
It is useful because it helps me to improve my design skills					

About Tool B: Poster with design ingredients

It is useful because it gives ideas that I can further develop					
It is useful because it guides my design process					
It is useful because it offers new knowledge of the emotion					
It is useful because it helps me to improve my design skills					
It is useful because it is clear to understand					
It is useful because it provides the information that is needed to design					
It is useful because it is effective to develop a design solution					
It is useful because it gives a structured overview of the emotion					
It is useful because I have space to explore my ideas					
It is useful because I can use it for future projects					

Appendix 12

Results - Design task

	About the Design Task		
6	I had the right conditions to complete the design task	3.56	0.62
7	I had enough time to complete the design task	3.89	0.68
8	I think that the design task was clear	4.00	0.49
9	I think that the design task was difficult to complete	2.28	0.96

Appendix 13

Designs generated in the workshop

D12. Product: helmet; emotion: anticipation

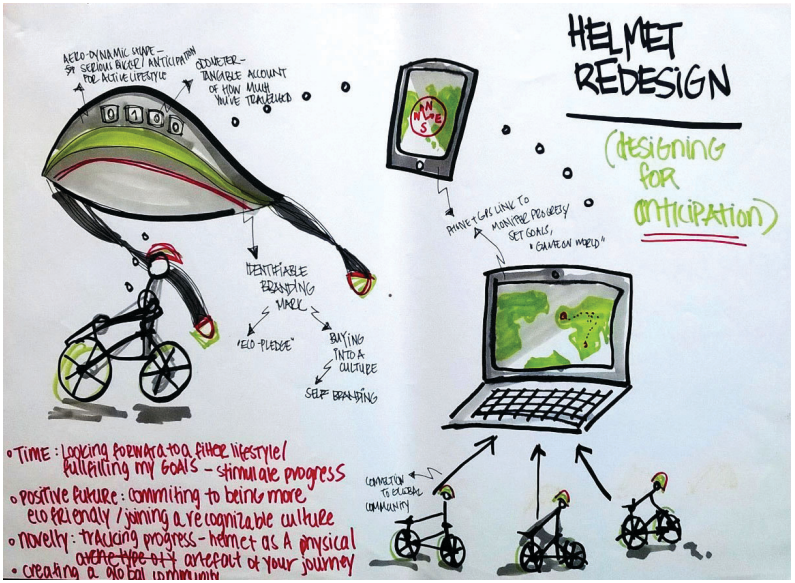


Figure 1. *Helmet designed to elicit anticipation*

D12. 'The idea of the helmet is to have this iconic branding and it tracks how many miles you cycle on that day. So you can tail your progress on internet. Other people can also use it and then you can have this global community of bikers. Every time that you are using a helmet is a reminder that you are being more ecologically friendly, creating an Anticipation of a more positive future. It is similar to the 'running app' in which you can see how much you are running. The helmet then becomes this physical artefact for how much you have improved, how much you have moved and how active you have become.'

D14., D15. and D16. Products: toaster and kettle; emotion: anticipation

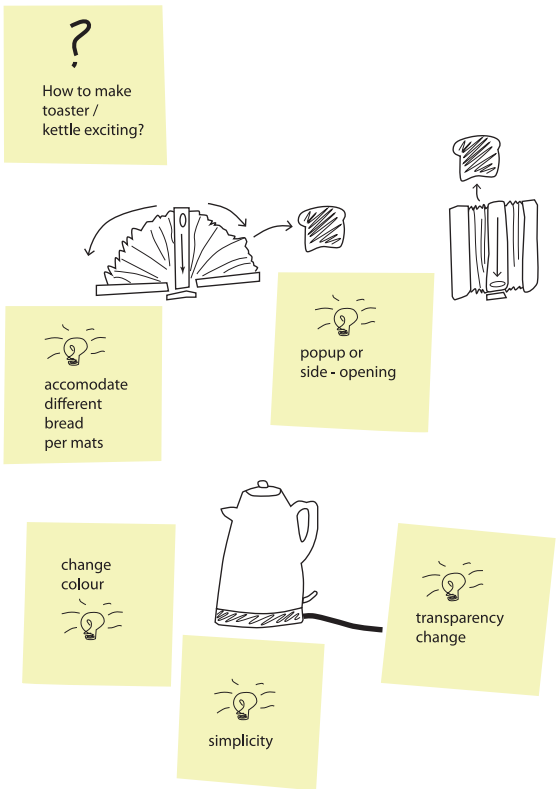


Figure 2. *A toaster and a kettle designed to elicit anticipation*

D15. We had to design a kettle and a toaster, and our emotion was Anticipation. Anticipation is when you are expecting to get some pleasure from the product. So, we came up with different kind of ideas about how a kettle and a toaster could interact with us. Maybe, it gives you the horoscope when you wake up, or maybe there is an interaction between the kettle and the toaster. Then we realised that all this applications can be done with a mobile phone. We tried to come up with simple ideas.

D16. The product, for example the toaster, has to be adaptable and controllable by the user. The levels of toast, most toasters have this feature, and it would be expected. We also wanted to make sure that you can accommodate various widths of

bread. And important part of Anticipation is expecting something new happening every time. I do not know how much of that people really want from a toaster. I am not sure a toaster needs to be actively exciting, but if people are looking for variety they should at least be able to put a different kind of bread in everyday and have the toaster cope with that.

D14. Our idea for the toaster is that it could be a cut toaster, so, maybe for today you want a regular bread, but for tomorrow you want a bigger width. The toaster has a cut in the middle, so you can put the bread in, and because of this function, it is easier to clean it. So, this toaster has two different ways of using it.

D15. For the kettle, we imagined a range of colours that are related to the temperature of the water. So it is blue when the water is cold and red when is hot. There is also a range of different hues between these two colours. By using these colours you can see immediately the temperature of the water. In this way you will be able to manage the temperature of the kettle, for example, if you do not want hot water but medium. It is transparent to look inside.

D16. We also use the colour to show the water boiling in.

D5. Product: helmet; emotion: confidence



Figure 3. *A helmet designed to elicit confidence*

D5. 'I wanted to design a helmet when you wear it you feel more confident. So, the normal helmet make you feel safe when you ride a bicycle, so for a more confident helmet is where it senses the danger and the helmet will tell the user that there is a potential helmet, you have to slow down. It is something similar to cars, when you wear the safe belt and there is no danger, you can relax, but when there is a hard break the belt holds you to the seat. So, the helmet will do the same thing, when there is no danger, it is relax, it is normal, it is comfy but when it predict that there is danger it will make a perfect protection to protect you'.

D6. Product: mp3 player; emotion: confidence

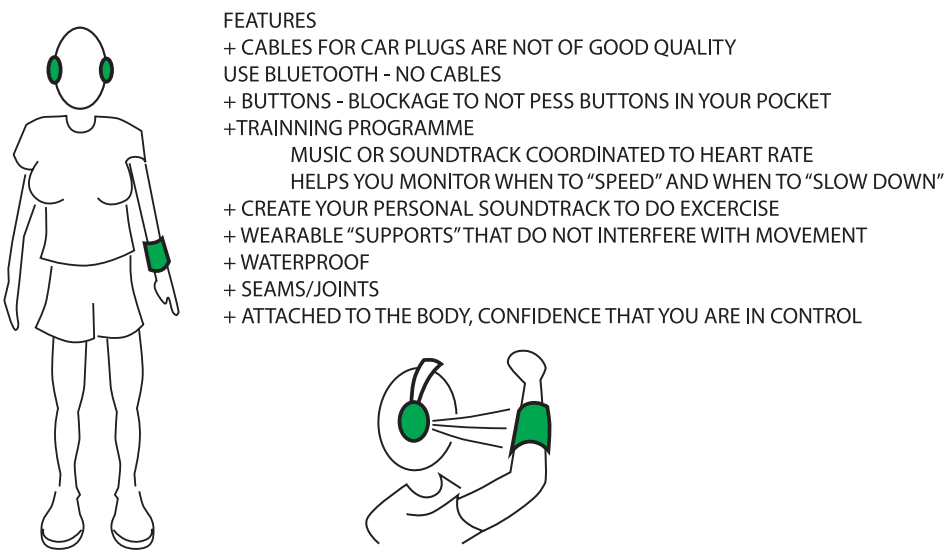


Figure 4. *A mp3 player designed to elicit confidence*

D6. 'Thinking about my routine, I realised that I used mp3 players when I am running. But I do not like the cables because it is the first thing that breaks. Then, I started to think about how this Mp3 player could have a training programme for running. Like having a soundtrack, for the training that you want to have. The music will be selected by monitoring hearth rates, so, you will have a song that matches the speed of the music or the bits of the music will change according to the training.

In a certain moment of the training you will be running faster and at another time you will slow down. The music will react to that. Then I thought that everything should be attached to the body rather than having lots of gadgets hanging. This will increase the Confidence because you are in control of the Mp3 Player.'

D7. Product: kettle; emotion: confidence

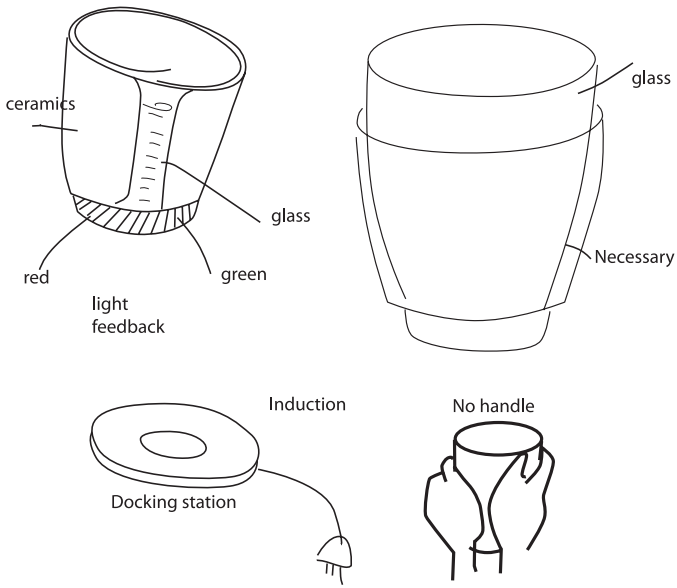


Figure 5. *A kettle designed to elicit confidence*

D7. 'We had Confidence, and I had the kettle to design for. We start by discussing why we do not trust the kettle, why we do not like the kettle, and we came to some points. It is because there is danger because there is boiling water and electricity in one object and also the point of hygiene that we see the dirt inside. Also the materials of the product are important and the ergonomics. We discussed about products that are already in the market. And then we discussed about the design of a new kettle, maybe we choose a familiar seen scenario when the tea and coffee are well developed in for example the Japanese culture. They use bowls/cups that they do not need a handle, and they hold the cups with both hands. And they feel the heaviness and the heat as well. So, actually there is not kettle anymore, just a cup, simplifying

and reducing the amount of water that you use. There is no waste, you just fill up one cup of water and you get this boiled up. And the way you separate electricity and hot water to make it feel safer and make you feel more confidence about it is to have a cup that has induction technology in it. The water is not directly connected to the electricity, there is a dock station, so, when you want to heat up the water you place the cup there. So the final solution is just a cup with no handles made of ceramics, and there is also a part made of glass, so you will see the water. The dock station also gives you feedback with light, when is green it is heat up and when is red is not hot yet. So, it is a simplification of the kettle chunk that we have now'.

D9. Product: drill; emotion: confidence

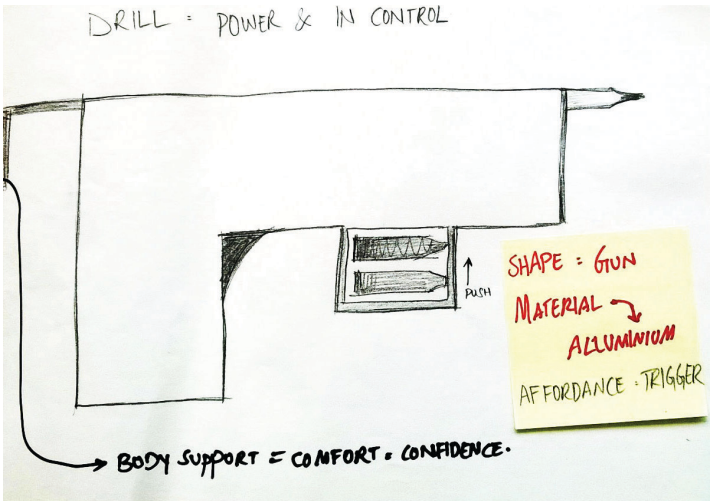


Figure 6. *A drill designed to evoke confidence*

D9. 'My task was to design the drill trying to evoke Confidence. The first thing that came to my mind was that the drill is a destructive tool and the nearest typology that I could associate was a gun. A gun is control-destructive. So, I took the main features of the gun, like the trigger to be an affordance for the drill button. There is also a cartridge from which the drill takes the drill bits. I was also thinking about the noise that the drill makes, which is also a feedback, which could be like 'loading' the drill. The drill has also a body support on the back that you can use as a body

chest that gives you support and comfort. This is to create Confidence in the user. The body of the actual drill is aluminium'.

D1. Product: speaker; emotion: inspiration

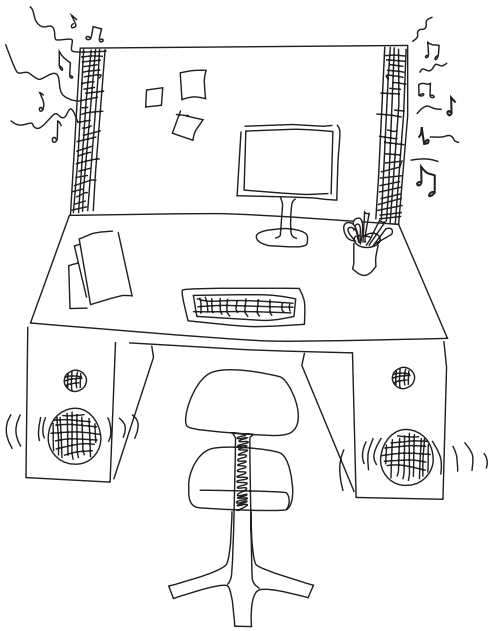


Figure 7. *A user-trained work station designed to evoke inspiration*

D1. 'Our positive emotion was inspiration and I had a speaker to design. I was thinking about the fact that sometimes when I am in the kitchen, and I am cooking my boyfriend put on some music, and it is the wrong music and makes me feel angry because it is the wrong music. We also had an interesting lecture about the triggers that make someone to work harder and the things that put you in the right mood to focusing on your work. So, I thought that it was interesting to integrate the sound system with your work station, so they will become one thing. I used a personal work station which incorporates a sound system, speakers, for self-employed workers. So users who maybe do not have their daily routine and need a routine. They could use this work station and speakers to develop that routine, because it gives them a musical landscape as the day develops and overtime once they are

trained, the work station rewards them by giving them a musical landscape. The connection would be connecting the user with music as an enjoyable activity, the music will enhance your mood engaging with your core being and enhance your own professionalism. And then to flourish, it will help users to establish and maintain a healthy focused routine using a musical landscape which feeds with their daily rhythms triggering their imagination, aiding focus, exciting them and creating Joy. It could also be silent for reflective periods. This product helps to improve your routine and making people more productive. Possibilities are looking at routings from a more imaginative, exciting way rather than a routine associated with the daily grinds. For self-expression, it is created through specific music that makes up the user's landscape. It is a flexible outcome as it is user-trained and variable due to worldwide music library'.

D2. Product: hard disk; emotion: inspiration

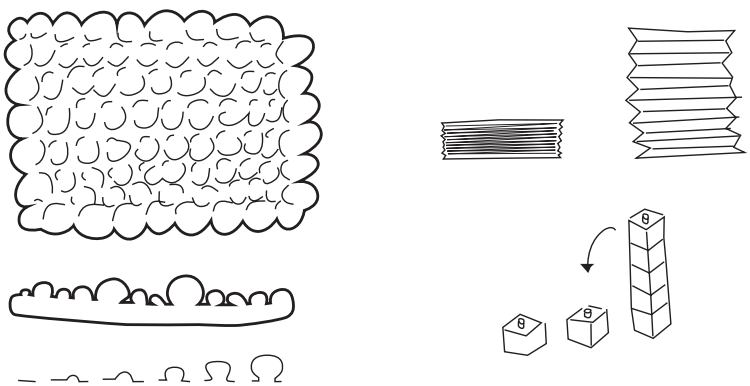


Figure 8. *An external hard disk design to elicit inspiration*

D2. 'I was also looking at hard disk, and I had inspiration. So, a traditional hard disk is a black box and it is possibly everything about it is uninspiring. What I found from looking at the different things on the emotion maps was that connection was one of the significant ones for the hard disk, because there is not connection with the hard disk. It is just this black box that you plug in, and you hope that it has all your stuff on it. You actually have no idea whether it does or not, and you plug it in and see the files. So, one of the ideas was to break in it up in different compart-

ments, so you can see physically how you arrange it and perhaps organise the files in a physical manner as well as on the actual computer. And another idea was to physically represent how full the actual device is. Perhaps it expands in some ways. It has an accordion structure shows that is filling up or how much space it has. The last version is like an idea of a mattress, and air bed, filled with air, perhaps the bubbles fill up to suggest how full it is. Because it is this object that stores data and it offers no connection as a physical object with what it is storing'.

D8. Product: lamp; emotion: inspiration

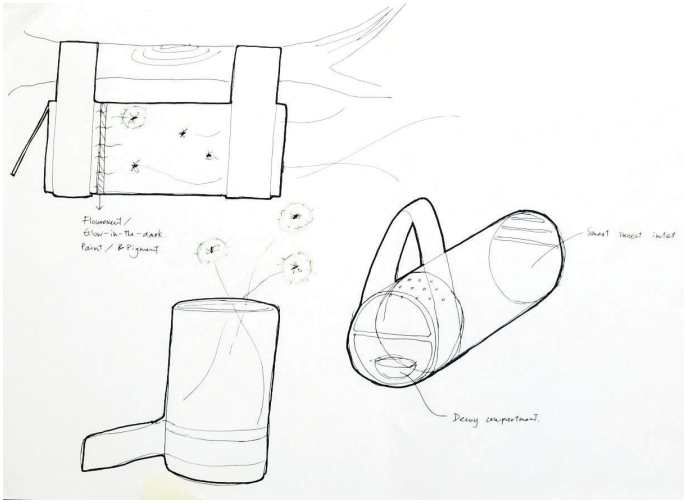


Figure 9. *A lamp designed to elicit inspiration*

D8. 'I designed a lamp trying to evoke Inspiration. It is another concept about insects, this time it has to deal with real insects. This lamp is for outdoors use, so it got like a trap, on one side the insects get in, and at the other end you put your decoy, whereas it is honey or food, it depends what kind of insects you want to attract. So, for examples, when flies come to the end they will get this like fluorescent/glowing-in-the-dark paint on their body. So, when the container is filled up with flies you have a fluorescent lamp, and at the end of the day when you are done with the lamp, you can release and freed fire flies. This inspires people to go out and catch whatever insects they can.'

D17. Product: toaster; emotion: inspiration

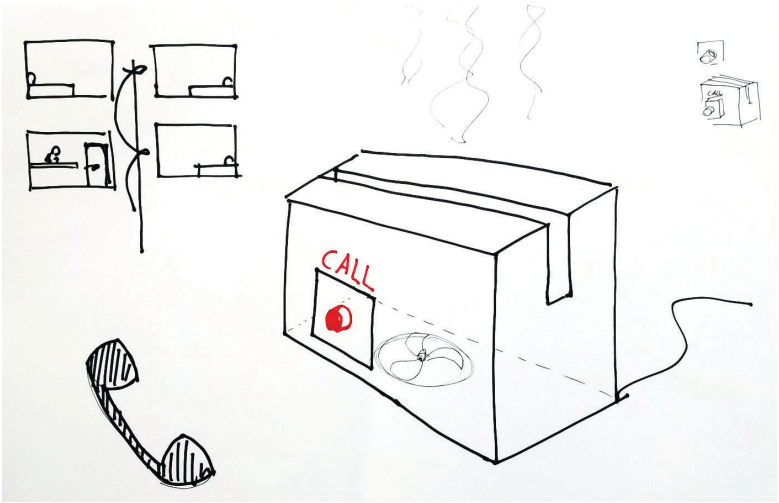


Figure 10. *A toaster designed to elicit inspiration*

D17. 'My emotion is Inspiration, and the object is a toaster. I start this approach, by asking, how can we get inspired in this kitchen environment? And it is mostly by raising the appetite and make sure that we make good food. And then I started with the toaster, how we can raise the appetite with a toaster. For me, it is actually through the smell. So, when I turn it on, I can provide some smoke (with a smell) and then detect the smell of bread and I feel that I have to eat my breakfast now. So, it is all about the sample (of the smell) to provide the right sample to people. Then I came with the scenario of a house, in which there are three rooms, and in each room there are different people, as it is common in London. Then I thought, how can I actually inspire the people of my flat? Maybe by saying that I am going to eat my breakfast now. So, it is mostly as a call, I am not changing anything about the object. It is a very basic one. I am just changing the typology of the button, and instead of saying I am going to eat know, and I am going to tell anyone that I am going to have breakfast now. It is more like inviting people to come with me, for example, my family, my kids, it can be anyone. For the technical aspects, I could have a fan to spread the odour, further, and faster. It is more like if I am calling for a meeting'.

D18. Product: kettle; emotion: inspiration

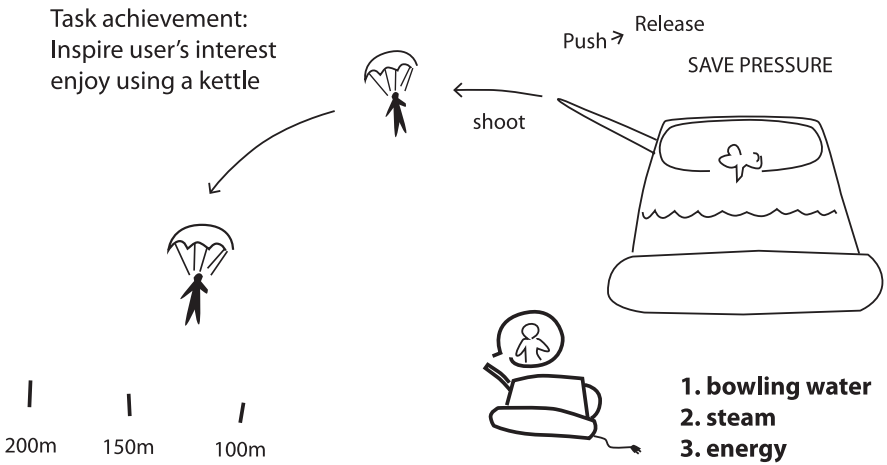


Figure 10. *A kettle designed to elicit inspiration*

My topic was a kettle, so I just think that if I could have a task achievement as a sort of game, this could inspire people to involve in the usage of this kettle. When you boil water it creates a steam, this steam can be used as an energy resource, so on the top of the kettle you can have a button to shoot a little man. The aim of the game is to shoot it as far as possible, one hundred metres, two hundred metres, etc. Then you can compete against your friends.

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