

# the colors of care

---

Design & Emotion 2014  
9th international conference | Colombia

---

Organizers:



the Design & Emotion Society raises issues and facilitates dialogue among practitioners, researchers, and industry in order to integrate salient themes of emotional experience into the design profession.



the  
colors  
of care

---

Design & Emotion 2014  
9th international conference | Colombia

---

October 6-10/2014. Bogota, Cali & Medellin. Colombia

International Conference on Design and Emotion (9th : 2014 : Colombia)

The colors of care : 9th International Conference on Design & Emotion / autores compiladores Juan Salamanca ... [et al].

-- Bogotá: Universidad de los Andes, Facultad de Arquitectura y Diseño, Ediciones Uniandes, 2014.

744 p. ; 21,5 x 27,9 cm.

Otros autores compiladores: Pieter Desmet, Andrés Burbano, Geke Ludden, Jorge Maya.

ISBN 978-958-774-070-7

1. Diseño - Congresos, conferencias, etc. I.Salamanca, Juan II. Desmet, Pieter III. Burbano Valdés, Andrés Eduardo IV. Ludden, Geke V. Maya, Jorge VI. Universidad de los Andes (Colombia). Facultad de Arquitectura y Diseño VII. Tit.

CDD 745.2

SBUA



Universidad de los Andes  
Pablo Navas Sanz de Santamaría - Rector

Facultad de Arquitectura y Diseño  
Alberto Miani Uribe - Decano

Departamento de Diseño  
Hernando Barragán Romero - Director

Primera edición octubre de 2014

© Juan Salamanca, Pieter Desmet, Andrés Burbano, Geke Ludden  
y Jorge Maya autores compiladores

© Universidad de los Andes  
Facultad de Arquitectura y Diseño

Ediciones Uniandes  
Carrera 1ª núm. 19-27, edificio Aulas 6, piso 2  
Bogotá, Colombia  
Teléfono: 3394949, ext. 2133  
<http://ediciones.uniandes.edu.co>  
[infeduni@uniandes.edu.co](mailto:infeduni@uniandes.edu.co)

ISBN: 978-958-774-070-7

Corrección de estilo  
Matthew Battle, Tiziana Laudato y María del Mar Ravassa

Diseño y diagramación:  
Angélica Ramos, Adriana Páramo  
Taller de Medios. Facultad de Arquitectura y Diseño. Universidad de los Andes

the  
colors  
of care

---

Design & Emotion 2014  
9th international conference | Colombia

---

diseño • emoción • innovación

October 6-10/2014. Bogota, Cali & Medellin. Colombia

## SUBTHEME 5 Experience and Interaction



---

Mediated and unmediated experiences between individuals or collectives of people interacting products and services.

**Includes these topics:**

- Product-service Systems
- Experience Design
- Human Factors & HCI
- Affordances & Semiotics

## Full papers

To Learn is to Experience: How our Daily Interactions with Objects, Events, the Environment, and People Can Be a Classroom <i>Kok Cheow Yeoh</i> .....	587
Appearances Can Be Deceiving. The Portayal of Weight and Embodied Meaning Portrayal in Product Design <i>Thomas Van Rompay, Francien Verdenius, Vanessa Okken And Ad Pruyn</i> .....	595
The Effect of (Un)Pleasant Sounds on the Visual and Overall Pleasantness of Products <i>Elif Özcan, Hendrik N.J. Schifferstein</i> .....	601
Learning from the Positive: A Structured Approach to Possibility-Driven Design <i>Simón Jiménez, Anna E. Pohlmeier, Pieter M.A. Desmet, Gerjan Huzen</i> .....	607
Construction Parameters for Hypermedia Comics to Learning Based on the Gamification Concept <i>Raul Inácio Busarello, Luciane María Fadel, Vania Ribas Ulbricht, Patricia Biegging</i> .....	616
The Influence of Color in Fragrance Perception. Designing Packagings for Perfumes <i>Camila Assis Peres Silva, Clíce Sanjar Mazzilli</i> .....	623
Unified User Experience Model Enabling a More Comprehensive Understanding of Emotional Experience Design <i>Constantin Von Saucken, Rafael Gomez</i> .....	631
Touch Sensations in an Online Store. The Influence Of Image Interactivity On Emotional Experience and Product Evaluation <i>Suzanne Overmars, Karolien Poels</i> .....	641
A Perspective Shift for a Human-Life-Friendly Product Service System (Pss) <i>Jeong-Hyeon Kim, Kee-Ok Kim</i> .....	650
Everyday Interactive-Kinetic Environments: Examples in Latin America. Formatting Guidelines For Paper Submissions <i>Carolina M. Rodríguez, Marta D'alessandro</i> .....	658
Path to Sustained Usage: A Model for Long Term Experience In Technological Products <i>Hakan Boğazpınar, Yekta Bakırlioğlu, Armağan Kuru, Çiğdem Erbuğ</i> .....	667
Affective Timelines. Towards the Primary-Process Emotions of Movie Watchers Measurements Based on Self-Annotation and Affective Neuroscience <i>Marko Radeta, Zhabiz Shafieyoun And Marco Maiocchi</i> .....	679

Towards an Empirical Model of the Ux: A Factor Analysis Study <i>Natalia Ariza, Jorge Maya</i> .....	689
Nine Ways to Wake Up: Bedside Alarm Clocks Designed by a 'Meaningful Interaction' Learning Approach <i>Bahar Sener, Owain Pedgley</i> .....	698

## Short papers

Hugbug. A Wearable Interface for Facilitating Digital Design for Children <i>Foad Hamidi, Natalie Comeau, Karla Saenz, Melanie Baljko</i> .....	706
The Influence of Aesthetics on Young People's Trust of Information <i>Allison Sivak</i> .....	710

## Design cases

Flui. Perceiving Time and Space through Emotion <i>Rafaela Beraldi Zeidler, Janaína Mendes Bueno De Godoy, Ken Flávio Ono Fonseca</i> .....	713
Femo: Emotional Design for Kidults <i>Diana Catalina Garzón Rodríguez</i> .....	719
Giant, a Social Design Project: Enhancing the Buying Experience in High Frequency Stores (Hfs) In Bogotá. <i>Jackeline Arango Zapata, Marcela Velásquez Montoya</i> .....	724

## Workshops

The Aura of the Digitally Fabricated <i>Jussi Ängeslevä, Michael Burk</i> .....	730
Skintimacy. Touch as Digital Interaction and the Exploration of Intimacy <i>Alexander Müller-Rakow, Juan Pablo García</i> .....	733
City Sound & Emotion. The City Understood as an Emotional Scenario From the Perspective of Sound <i>Ivan Chaparro, Ricardo Dueñas</i> .....	735
Just a Moment, Please!. Improving the Overall User Experience, Moment by Moment <i>Marco Van Hout, Flin Nortier</i> .....	735
Affective Decisions and Recommender Systems <i>Juan José González, Mateo Ospina, Juan Salamanca, Héctor Mejía</i> .....	741

# PATH TO SUSTAINED USAGE: A MODEL FOR LONG TERM EXPERIENCE IN TECHNOLOGICAL PRODUCTS

Hakan Boğazpınar, Yekta Bakırlioğlu, Armağan Kuru, Çiğdem Erbuğ  
Middle East Technical University

✉ hbogazpınar@gmail.com, yekta@metu.edu.tr, k.armagan@gmail.com, erbug@metu.edu.tr

## ABSTRACT

Happiness is one of the major influences in what makes people use products, and what makes those products an important part of daily life. What drives these aspects, some arisen from personal appraisal and some directly related to the product qualities, are important for designers, as the experiences designers form tend to affect these aspects heavily. Driven from this idea, in this paper, an exploration on the evolution of positive user experience with technological products was conducted. We asked users to think about the technological products they enjoy the most, how their experiences changed over time, and what makes them still use the product. Different qualities regarding their experience were found, some human-related, some product-related, and the relations between these qualities were looked upon further in depth. The result presented itself as a theoretical model to achieve sustained usage of technological products.

KEYWORDS: *positive experience in technological products, happiness in product use, pleasure*

## BACKGROUND OF THE STUDY

Technology has commercialized to a point where it is not regarded as a novelty piece, rather a given in products. The products became capable of doing more than what the users need or want, and the market is filled with many different personal technological products in different sizes, shapes, colors, and features. The user is baffled with the excessive amount of possibilities, yet still manages to favor one of them over all others. As an example, the studies show that 48% of product returns happen because of non-technical results and 28% of the those are because the product did not work as expected (Ouden et al., 2006). In that sense, the focus has already shifted from the traditional task-oriented approach of HCI, and the attempt has gone beyond understanding users' functional needs, to understanding the aspects that satisfies users' pleasures (Hassenzahl, 2008).

In the last decade, the user experience became a trend, but also an insufficiently investigated topic due to the lack of empirical studies conducted (Hassenzahl & Tractinsky, 2006). In this sense, Vermeeren et al. (2010, p.521) drew out a comprehensive framework by stating the UX is 'to be generally understood as inherently dynamic given the ever-changing internal and emotional state of a person and differences

in the circumstances during and after an interaction with a product'. As an early attempt, Jordan's (2000) identification of four types of pleasures, namely, *physio-pleasure*, *socio-pleasure*, *psycho-pleasure*, and *ideo-pleasure*, shed light on the understanding of pleasures that arise from the use of technological products. Such an identification can highlight a significant relation between user's holistic perceptions with products. According to Hassenzahl and Tractinsky (2006), inherent emotional states refer to universal human needs that are satisfied by the hedonic aspects of UX, yet do not necessarily have to accommodate functional/pragmatic qualities of the products. Moreover, the empirical studies showed that hedonic and pragmatic qualities both promote the desirability and attractiveness of products (Cila & Erbug, 2008; Hassenzahl, 2003, 2007; Schrepp et al., 2006). Their influence relatively changes in relation to the context of evolution and impulsive orientation of the user (Hassenzahl, 2008).

Currently, user experience literature has evolved from solely understanding the emotions towards products, but has kept the dynamism of emotions and turned those into a long-term positive experience (Desmet & Hassenzahl, 2012). Thus, understanding people's experience in long-term usage can lead designers to turn an experience into a 'happy experience'. The study of Chitturi et al. (2008) showed that the impact of hedon-



ic aspects on customer loyalty is more influential compared to pragmatic aspects of the product in the long term. Contrarily, most of the empirical studies of UX mainly focus on the evaluation of short-term experiences (Vermeeren et al., 2008), and single behavioral episodes that mostly ignore the ever-changing goals and needs of the user (Vermeeren et al., 2010).

## CONTINUITY OF POSITIVE EXPERIENCE

Conception of long-term experience was first introduced by Dewey (1938) as continuity of experience. As he stated; each experience is influenced by previous ones and each affects the path of future experiences. Thus, regarding the dependencies that are formed through previous experiences, a user defines a specific *path* about his/her way of doing and experiencing (Dewey, 1938). It is interesting to see that, short-term experiences have significant impact on the overall UX (Forlizzi & Battarbee, 2004) whereas the evaluation of overall UX is basically not a consolidation of individual and short-term experiences (Hassenzahl & Ullrich, 2007). From a parallel perspective; the study of Karapanos et al. (2009) shows that the user's judgmental process is predominated by the utilitarian product aspects such as usability, functionality etc. mainly in the initial stage, however as the authors stated, the hedonic aspects take over in the long run.

The study of Kuru (2013) draws a model to explain the process of sustaining usage for a personal technology in four phases. According to the model, people's 'willingness' and initial goals are essential for leading people to become users. In the early days of usage, people explore the product and 'initial benefits' are expected to be satisfied. Once they feel that 'initial goals' are achieved, in the 'extended benefits' phase, expectations are increased to keep using since the needs of the user change. Finally in the 'adoption' phase, users expect the product to offer more personalized interactions that inspire long-term use.

Similarly, Bodker and Christiansen (2012) investigated the long term UX from the points of micro and macro levels. As they stated; in the micro level the user first adapts and then adopts the product by passing through purpose, tradition, and idiosyncrasy phases. In the purpose phase, the user is initially in a state of anticipation and explores the functions to find use purposes. Tradition is the 'micro level appropriation phase' where the user develops repetitive usage rituals; in other words, the use purposes that were found in previous phase are habitualized. In the idiosyncrasy phase, the user develops particular usages in accordance with their personal desires and needs. Concurrently at the macro level, using capabilities of user are changed. As the usage evolves into different contexts, these context changes alter the user's ways of living. At the macro level, rather than integrating the new product into life, the life of the user expands itself and they get involved in activities that were not previously anticipated.

These current studies show that there is a tendency to study the journey of long-term experience, how the experience and

user's relation with the products evolve over time, from the first moment of encounter to simply becoming a part of every-day life. On the other hand, what makes people happy with a product can be a source of pleasant and pleasurable experiences (Nicolas et al., 2013).

Our interest in this paper is not to involve a problem-driven research (Desmet & Hassenzahl, 2012), but rather to search for possibilities upon asking users their stories about the products they enjoy. In this manner a study was carried out with the hope of extending our understanding of affecting product-related qualities and affected human-related qualities that inspire sustained usage through product stories, and how these are affecting relationships and positive user experience over time. In short, the study aimed to find out an initial model for understanding the design qualities that are leading sustained usage in technological products. Thus, we will explore these qualities through the following questions: [1] What are the human-related qualities and product-related qualities affecting sustained usage?; [2] What are the relations between human-related qualities and product-related qualities according to use phases; and [3] What is the relation between pleasure in use and human-related qualities? If there is a relation, what are the product-related qualities affecting pleasure in use? The following section outlines the data collection and analysis processes of the empirical study that we conducted to answer these questions.

## METHODOLOGY

To better understand the evolution of positive experience in technological product use, we conducted a qualitative research study asking twenty participants to explain their experience with the technological products that they enjoy the most. We interviewed the participants and made structured analysis to find the details of their experience.

### *Selection of Participants and Products*

The study was intended to include users that are actively using at least one technological product for a period of time in order not to face a strong bias in participants. Hence, availability sampling was employed insofar as we requested twenty-five people from our work environment to participate in the study. All of them accepted our request, so twenty of them (ten females and ten males, whose ages ranged from twenty-five to thirty-five) were selected in accordance with our personal judgments about who may contribute significantly to the study in terms of their familiarities to the technological products. In total, of the twenty participants, ten selected smart phones, five selected tablet PCs and the rest selected digital cameras, game consoles, smart TVs, headphones, and laptop PCs as their favorite products.

### *Data Collection*

To uncover the evolution of positive experience with technological products, we conducted semi-structured interviews.

At the beginning, the participants were asked to pick one technological product they enjoyed most according to the experience rather than appearance. They were free to choose whatever technological product they wanted to, regardless of the function of the device. This was considered to indicate the ‘positive user experience’ they have with the product they picked. The interview consisted of six main questions asking: (1) What the product is; (2) What their story with the product is; (3) How they got the product, what their impressions were of it when they got it, and how the relationship between the product and the user changed over time; (4) What the positive and negatives are for the product, and if there should be any changes in it; (5) What kept them using the product over the course of time; and (6) what is next for the product. The average duration of a session was thirty-two minutes.

### Data Coding

In order to analyze the collected data, a content analysis method (Krippendorff, 2004) for qualitative gatherings was employed. After all interviews were conducted, a structured qualitative data analysis flow was systematized. The analysis flow of collected data is summarized in Figure 1.

Taking into consideration the aim of the study and the research questions posed, to enrich the comprehension of the empirical manifestation of the study, while increasing the reliability of findings, an inter-rater reliability analysis using the Kappa statistic was performed to determine consistency among raters. A representative sample which includes 106 numbers of coding for 53 lines, and a glossary of terms sheet was prepared by researchers to conduct a pilot test with a



Figure 1. Data analysis flow

PRODUCT RELATED QUALITIES (THE PRODUCT IS...)	
QUALITY	MEANING
Aesthetically Pleasing	Having appealing visual properties
Compatibility	Being able to be used along/with other technological products/services
Connectivity	Being able to be connected to networks
Cost effectiveness	Having a price that seems viable in relation to its properties/features
Customization	Being able to match product features with user needs
Durability	Being able to withstand everyday physical abuse
Ease of Communication	Enabling communication with other people
Ease of Interaction	Offering an easy way to control/communicate with the product
Meaningful Data	Understanding the user and conveying related data in a meaningful way
Mobility	Being easy to carry around and available anywhere
Multi-functionality	Being able to carry out more than one task
Newness	Having technological/new features
Personalization	Offering more than one option to provide features according to user preferences/ desires/etc.
Popularity	Becoming known around
Product expression	Having expressive qualities that make people feel like they belong to a group etc.
Smartness	Being able to learn and act in response to users' needs
Social Enabling	Enabling communication with friends and other people around
Technological competence of product	Having technological features and their appropriateness for tasks
Upgrading (Obsolescence)	Being able to be renewed over time (physically or digitally)
Usefulness	Having features that help people to perform activities
HUMAN RELATED QUALITIES (THE USER)	
Adaptation	Can use product features adapt over a period of time
Change in habits	Can transform/change/modify the habits after acquiring the product

Change of 'Context'	Can do stuff in new/different contexts
Excitement	Feels excited due to the product usage
Familiarization	Becomes aware of what the user can and cannot do with the product
Feeling in-Control	Is sure s/he is controlling what's happening
Habitualization	Makes the product a habitual part of life (including frequent use)
Path Dependency	Carries habits/practices from previous experiences (with similar features) affecting the new experience
Pleasure in Use	Feels pleasure and enjoys using the product/system
Surprise (Disappointment)	Feels unpleasant as a result of the unexpected features, or lack of features

Table 1. Glossary of Terms

coder for observing reliability levels of data analysis flow. The inter-rater reliability for the raters was found to be Kappa = 0.790 ( $p < 0.001$ ). The disagreements were then discussed until an agreement was reached. Still, the Kappa value shows that there is evidence for the repeatability of measurements between coders.

During the analysis, we tried to discover the relations between product-related and human-related aspects of experience. Figure 2 shows a typical coding procedure. In the figure, the green-highlighted phrases indicate the causing product-related qualities, and the green arrows show which product quality they are related to. The blue-highlighted phrases indicate the affected human qualities, and the blue arrows show which human-related quality they are related to.

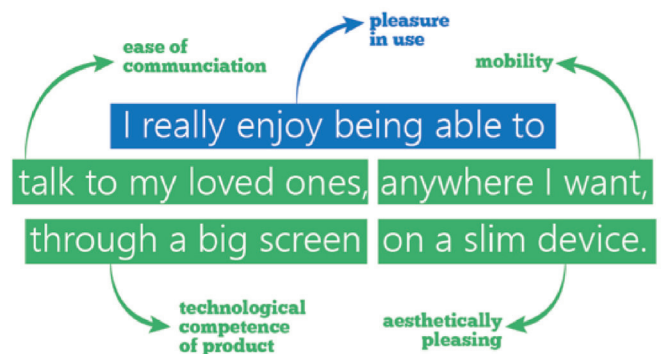


Figure 2. An example of how coding is done

LINES	CAUSING PRODUCT QUALITIES	+/-	RELATED PRODUCT PROPERTY	AFFECTED HUMAN QUALITIES	+/-	REASON / RESULT	TIME
To be honest, I don't think it's possible for us not to be aware of this product → not to see or hear about it — since the day that it was released.	popularity	+	Product's popularity	familiarization	+	To see or hear about the product continuously	Before use
But the facilities that it provides are not the kind that I can be unaware of. — I've been using it for almost 4 months.	usefulness	+	Facilities that the product provides for usage	sustained usage	+	Using the product for four months	Before use
To receive it as a present unexpectedly when I really need it made me incredibly happy.	usefulness	+	The fact that she thinks she needs the product	surprise	+	Receiving unexpectedly as a gift.	Before use

Table 2. Three examples of comments and how they are coded on the Excel sheet

By giving each text unit a number to relate units with a pre-determined theme, all text units were identified with at least one thematic code in Microsoft Windows Office Excel 2007 sheet, as displayed below. In order to sort human-related qualities and understand their relations with product-related qualities, we named the product phases that those qualities were mentioned, as before acquiring, learning phase, mastery phase, and stabilized use phase.

## RESULTS

Upon coding data, the analysis is done by counting the number of times the codes are mentioned and by counting the number of times a product-related quality and a human-related quality is mentioned together. On the table below, the left column is the list of product-related qualities and the top row is the list of affected human-related qualities (Table 3).

Qualities are sorted according to the times they were mentioned. Also, the relations between product-related and human-related qualities are highlighted according to the number of times they were mentioned together. According to the data, the most important human related qualities were pleasure in use, habitualization, change of context, path dependency, familiarization, adaptation, and change in habits.

Using these numbers, a holistic picture of the experience was figured out by covering both the human and product related qualities of experience (Figure 3). The visualized four-stage model explains the phases of positive experience with the presentation of technological products. By digging into the interview data, these phases were named as before acquiring, learning, mastery and post-mastery. We used our data to explain these phases in detail, therefore we separated the human-related and product-related qualities in our initial model.

In our model (Figure 3), the phases are represented as gray outlines encapsulating the human-related qualities dominant within them. Green lines indicate a parallel affect between human-related and product-related qualities, while red ones indicate an opposite relation. The size of the circles and squares are decided according to the number of times they were mentioned, and the thickness of lines indicates the number of times they were mentioned in relation.

This comprehensive picture shows that all phases are affected by similar product-related qualities (i.e. newness, mobility, multi-functionality, usefulness, ease of interaction, personalization, technological competence of product, and connectivity). In this figure, human-related qualities up to sustained usage were represented as steps towards it, yet we do not claim that it needs to be in such step-by-step fashion. We will discuss this idea in detail in the following sections.

	Ease of Interaction	Mobility	Novelty	Tech. Comp. of Product	Connectivity	Personalization	Usefulness	Multi-functionality	Aesthetically Pleasing	Durability	Customization	Social Enabling	Ease of Communication	Upgrading (Obsolescence)	Popularity	Compatibility	Product expression	Smartness	Cost effectiveness	
Pleasure in Use	30	21	7	55	11	5	32	7	19	22	5	11	9	8	1	10	1	3		257
Habitualization	13	19	2	3	22	21	6	11	2	1	2	6	3	1		3		1		116
Change of 'Context'	3	15	1		16	11	4	12		1		1	1			1				66
Path Dependency	17	2	26	2	2	4	4	4		2				2			1			66
Familiarization	3		26	1	2		1		1		4				15		1		1	55
Adaptation	8	2	6	1	6	12	4	3	3	1	4	1	1		1			1		54
Behaviour Change	5	11	1	5	8	5	3	7			2	2	1	1		2				53
Sustained Usage	7	7	2	1	3	9	7	4			2		2	3	1	1	1			50
Feeling In-Control	13	1	1	3	2	4	1	5	1		4		1	2						38
Excitement	1	1	6	2		1	3	1	3					1	1		3		1	24
Surprise (Dissappointment)	2			4	2		6		2		1		1	1			1	1		21
	102	79	78	77	74	72	71	54	31	27	24	21	19	19	19	17	8	6	2	

Table 3. The relations between human-related and product-related qualities

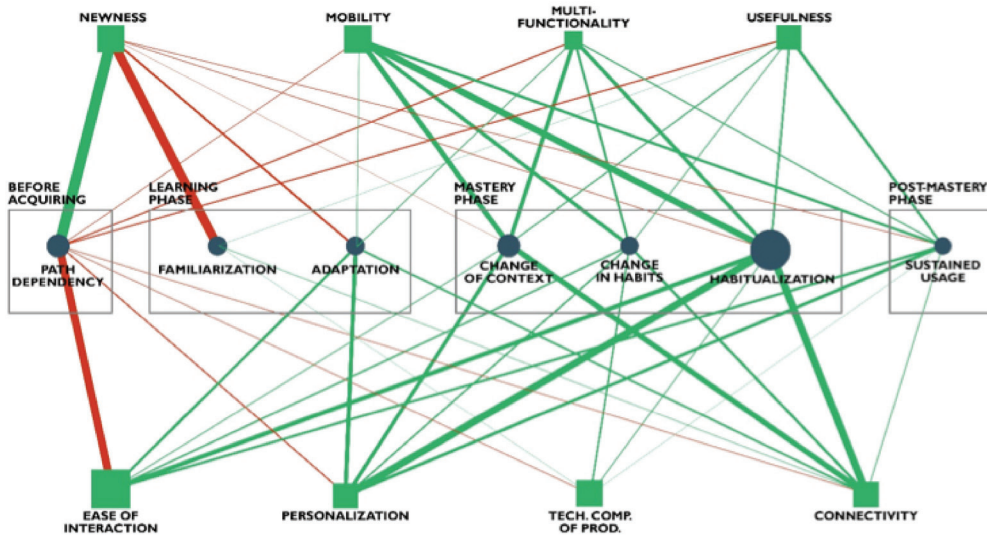


Figure 3. The relations between human-related and product-related qualities according to use phases

### Phase One: Before acquiring the product

Acquisition of a product, while having its own dynamic factors affecting the decision, the anticipation of a similar-to-the-previous experience almost never changes. That's why *path dependency* seems to be the only appropriate human-related quality dominant in this phase, backed up by the data collected (Figure 4).

As an example, Participant ten indicated regarding listening to music experience on her MP3 player and on her smart phone.

...You just put the song and it goes on. Okay, you have the option to shuffle on the phone too, but I feel like my MP3 player has a simpler interaction... I mean I know I have the option of downloading some music to my phone then listen if I want to, but no... I don't even do that. I always use my MP3 player to listen to music...

Although there is no pragmatic reason for her not to use the phone as an audio player, due to the *path dependency* of previous experiences, she refuses to use the music player feature on her phone. The majority of interviewees explained that their early experiences with negative expressions were due to the habits and practices that have developed from previous product experiences with similar features. They indicated that, product newness and lack of familiarization resulted in a negative user experience in the form of a mental barrier we call 'path dependent behavior'.

Upon this, reasoning behind the path-dependent behavior manifests as the formation of a mental barrier that arises from the *newness* and unfamiliarity of newly acquired technology that needs first to be broken and then re-established with the new experience. In other words, the newness of the

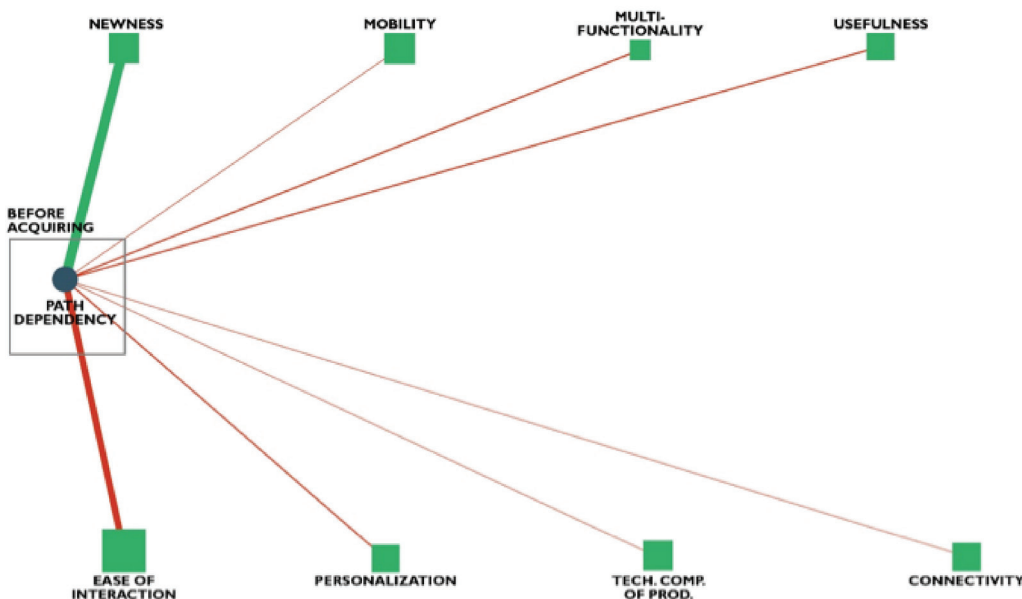


Figure 4. Qualities relations in Phase One

product will always support path dependency; as the product is new, the user does not totally accept this new product, but rather depends on the paths of previous experience. Thus, affecting product-related qualities such as *ease of interaction* and *usefulness*, actually work against it.

On the other hand, the most effective product-related quality that helps to break path dependency is *ease of interaction*. The break down is being realized when the user finds a way to interact with the device in a more comfortable way. As an example, Participant nine mentions the product-related qualities that helped break path dependency as follows:

...I can say that I am a game-addicted person, I was always playing little flash games on my laptop. I remember the first days with my tablet, I had some difficulties to find it a purpose, I mean, what I was going to use it for? My phone works great for checking e-mails, social networks and other stuff. Then of course, I dug through the application store and found some games that are good enough to keep me glued to the screen. Playing on touch-screen with gestures is definitely more fun compared to pressing some buttons. I mean, first it was a device that I'd spend my spare time with, but then it turned into something different. Now I continue my life in the time that's left from it ...

### Phase Two: Learning Phase

Learning phase of the product is about exploring the product, and understanding its capabilities on the micro-level (Figure 5). This phase is where the user finds his or her purposes for using it. Thus, *familiarization* and *adaptation* surfaced from the data as the dominant human-related qualities.

...Tablet was my first smart product, that's why I experienced some difficulties while using, at the beginning due to my lack of knowledge; it took some time to get used to having it in my life. First I've experienced serious problems while getting used to the interface. What I mean by the problems related to interface is that it was my first touch screen experience (Participant 3)

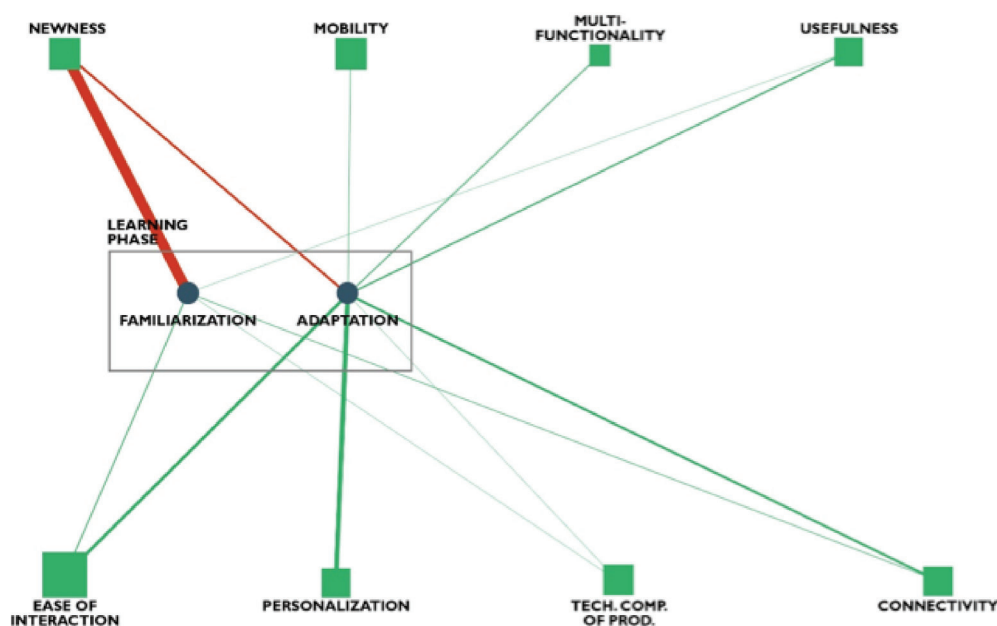


Figure 5. Qualities relations in Phase Two / Learning phase

As can be expected, *newness* of the technological product heavily works against the process of being familiar with it. Looking at the figure above, it can be perceived that *familiarization* and *adaptation* are consequent qualities, yet, they may concurrently occur within the learning phase. While having uncomplicated interaction with the device, *personalization* opportunities, being always connected to the networks and usefulness appears as the most effective product-related qualities at this stage. It is interesting to see that there are no relations between being *mobile* and *familiarization*, even though most of the products that are talked about are mobile devices.

### Phase Three: Mastery Phase

Mastery phase of the product is the decision point, in which the user either quits using the product or makes it a part of his/her daily life (Figure 6). Due to the structuring of this research, the participants have already passed the decision point and held onto their beloved products. Thus, we had the chance to shed light upon the dominant human-related qualities in the mastery stage.

*Change in context*, *change in habits* and *habitualization* are the human-related qualities dominating the mastery phase. *Change in context* is related to acquiring the ability to perform actions within different contexts and/or discovering new ways to perform routines as a result of the acquired technological product. Consequently, this human-related quality is affected mostly by a combination of *multi-functionality*, *connectivity* and *mobility*. To clarify the statement, expression of interviewee, Participant 12 can be given:

...when I need to write a business agreement - and you can understand how boring it is from its name - it means I have to sit at my table getting bored for approximately one and a half hours. On the other hand, I can write the same agreement in open air while drinking my coffee with my tablet and my boring agree-

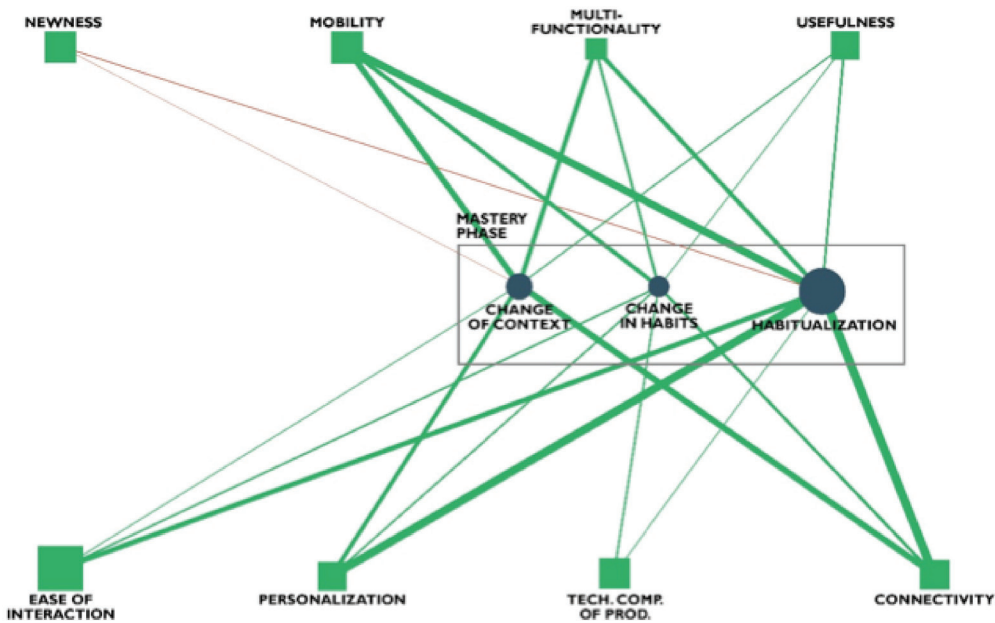


Figure 6. Qualities relations in Phase Three / Mastery phase

ment writing session turns into a pleasant experience. What I think is; it provides an opportunity for me to discover different aspects of my job beyond discovering the different aspects of the product.

*Change in habits* requires a newly introduced ability for the user, affecting the way s/he performs certain actions as a result. The surprising result on affecting product-related qualities is that *change in habits* is mostly affected by *mobility*, followed by *connectivity* and *multi-functionality*. Though, performing several actions (i.e. multi-functionality), connected to the internet (i.e. connectivity), in an easy manner (i.e. ease of interaction) present themselves as important affecting qualities. Being able to carry the device (i.e. mobility) that can carry out these actions surfaced as the dominant factor. Quoting the interviewee Participant nine:

... Normally I would never watch TV, but thanks to my tablet, I have started to watch. Because I can watch whatever I want, even foreign shows or series, wherever I want. Also it enabled me to reach and subscribe the journals that I could never reach, again thanks to the tablet, now I am reading more than I used to...

Finally, *habitualization* seems to be the most dominant human-related quality in the mastery phase. This quality suggests the product becomes a frequently used part of the user's life. While *mobility*, *multi-functionality* and *connectivity* majorly affect this human-related quality as well, *personalization* and *ease of interaction* seem to be important product-related qualities affecting *habitualization*. Interviewee Participant 3 exemplifies this, stating:

By then, John (her son) was recently born, and turning on the computer to stay in touch or going through newspapers to catch up with the news was quite a hassle. Consequently, I started to use this smartphone more frequently, since it was a ready-at-hand source, I could easily check my e-mails; look up the news, etc. Now, I always use my smartphone for these kinds of activities.

The results show that, all these human-related qualities dominant in the mastery phase are mainly affected by mobility, connectivity, and multi-functionality. In addition to these, personalization and ease of interaction present themselves as affecting habitualization majorly as well. These results should be studied further in order to understand how and why mobility has such an important role in changing habits.

### Phase Four: Post-Mastery Phase

The post-mastery phase is the use phase during which the product is totally embedded into the users' lives, owning its purpose, becoming a habit — or rather an integral part. The human-related quality in this phase is *sustained usage*, in other terms, what kept users using this product with such positive experiences. *Sustained usage* is affected by all the product-related qualities affecting the use phases, as can be seen below (Figure 7). Participant 7 expresses this *sustained usage* quality as follows:

You know, nobody thinks any other device than a phone to make calls. My smartphone has transformed into a device that I use to plan my days, to check my e-mails, to follow my social networks, to find addresses – other than making calls. In time, my relationship with my smartphone stabilized, I cannot say that I discover anything new on it after 2.5 years. But I can say, if my smartphone is taken away, I may get cut off from the people, the world. Hell, I may even get lost in my own city!

In relation, post-mastery stage is where sustained usage is achieved and is affected by all product-related qualities simultaneously. However, the way these qualities affect sustained usage is also explained as a result of passing time, upon passing through the human-related qualities before it. This may also suggest that sustained usage is the accumulating result of the human-related qualities in previous phases..

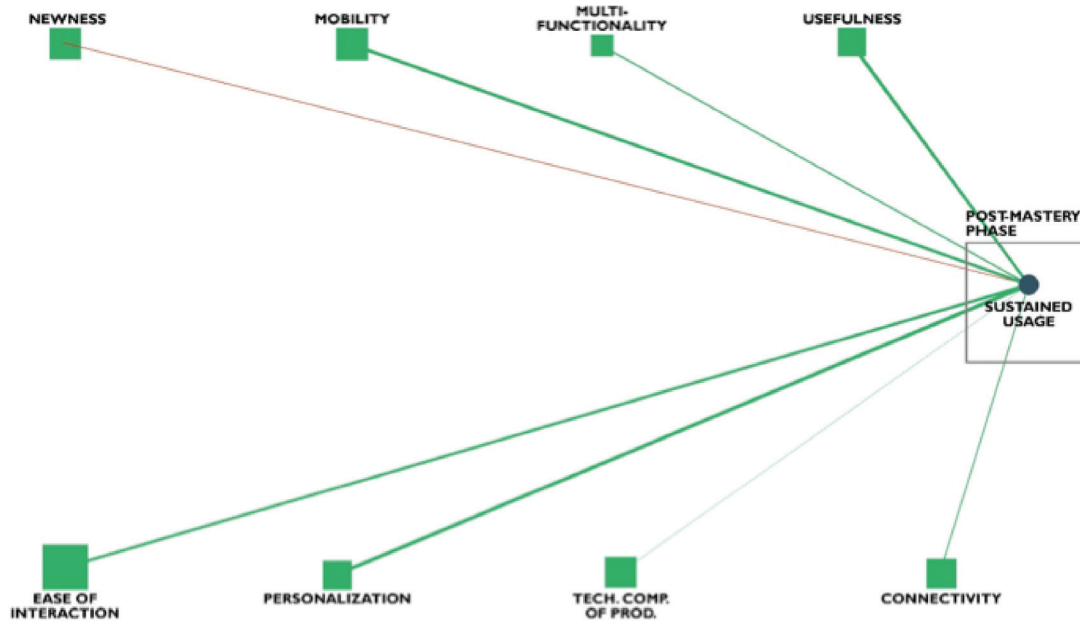


Figure 7. Qualities relations in Phase Four / Post-mastery phase

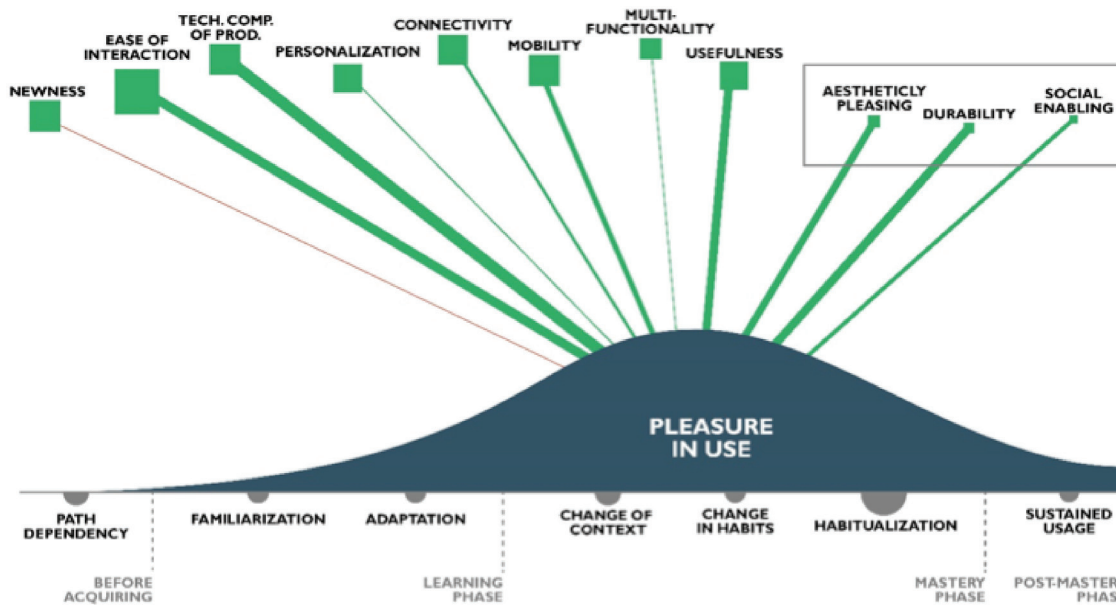


Figure 8. Pleasure in Use throughout use phases and its affecting product-related qualities

### *Pleasure in Use as a separate human-related quality*

In this study, pleasure in use is defined as the positive experiences that arise while using the product. For that reason, it is used as an umbrella term, which includes hedonic qualities (e.g. happiness, fun, joy, etc.). This decision for the study — to use ‘pleasure’ as an umbrella term — was made considering all different types of hedonic qualities and their insignificant effects on the product use phases individually (i.e. physio-, socio-, psycho-, ideo-pleasures). Consequently, pleasure in use was mentioned as the most among all human-related qualities and it does not belong to any use phase, but

rather presents itself in every use phases. Considering its unique position in this study, the graph below was developed (Figure 8).

In this study, *pleasure in use* seems to be affected the most by *ease of interaction*, *technological competence of product* and *usefulness*. On the other hand, different product-related qualities (i.e. aesthetically pleasing, durability, social enabling) presented themselves as significantly affecting pleasure in use, but not the other human-related qualities. This result is interesting in the sense that pleasure in use requires these three product-related qualities on top of the pragmatic human-related qualities.



The distribution of pleasure in use among product use phases is important as well, since it peaks in the mastery phase and falls back in post-mastery level. This may suggest that, the peak in pleasure in use through the mastery phase may lead towards sustained usage in the post-mastery level. We propose that, in order to understand this relation between pleasure in use and sustained usage as human-related qualities, further studies should be conducted.

### Relations between Product-related Qualities

Ensuring one product quality cannot mean to ensure a success of the product, therefore the product qualities should work together to create intended user experience (Crilly et al., 2008). Upon the analysis of data, it was found important to search for correlations between product-related qualities in the pursuit of grouping these qualities. For this, the Pearson Correlation test was used in order to determine whether there are significant correlations between product-related qualities ( $p < 0.05$ ). The results presented below (Table 4) indicate the significantly correlated qualities (highlighted in black).

Among these qualities, ‘newness’ presented itself as having a negative correlation with the other product-related qualities. This also shows why ‘newness’ is generally negatively affecting the human-related qualities. According to this data, the product-related qualities can be mapped according to their correlations to find out the groupings in between them.

Results indicate that ‘social enabling’, ‘durability’, and ‘aesthetically pleasing’ are correlated with each other and these three are also highly correlated with ‘technological competence of the product’, ‘usefulness’, and ‘ease of interaction’. In relation to our previous findings, we can say that this group affects pleasure in use in general.

The second grouping presents itself due to the correlation between ‘mobility’, ‘multi-functionality’, ‘ease of interaction’, and ‘connectivity’. This group affects the mastery phase, as can be seen in previous sections. Another linear grouping occurs between ‘personalization’, ‘connectivity’, ‘multi-functionality’, and ‘ease of interaction’, which affect the learning phase.

### DISCUSSION

Upon analysis of the collected data, an initial model for the path to sustained usage was developed (Figure 10). This path does not suggest the way to design and produce products that achieve sustained usage, but rather shows the common qualities that are observed for the products that achieved it.

In this model, the outer circle indicates the product-related qualities (i.e. *ease of interaction, multi-functionality, connectivity, personalization, mobility*) affecting the path the most throughout the use phases (i.e. *before acquiring, learning, mastery, post-mastery*). The inner yellow circle shows the

	Ease of Interaction	Mobility	Newness	Tech. Comp. Of Prod.	Connectivity	Personalization	Usefulness	Multi-functionality	Aesthetically Pleasing	Durability	Social Enabling
Ease of Interaction		,475	,090	<b>,855**</b>	,130	-,030	<b>,873**</b>	,107	<b>,847**</b>	<b>,881**</b>	<b>,806*</b>
Mobility	,475		-,641	,582	<b>,826*</b>	,473	,625	<b>,832*</b>	,545	,562	<b>,813*</b>
Newness	,090	-,641		-,085	-,604	-,630	-,172	-,669	-,083	-,043	-,298
Tech. Comp. Of Prod.	<b>,855**</b>	,582	-,085		,137	-,208	<b>,980**</b>	,112	<b>,980**</b>	<b>,991**</b>	<b>,879**</b>
Connectivity	,130	<b>,826*</b>	-,604	,137		<b>,777*</b>	,184	<b>,898**</b>	,165	,141	,540
Personalization	-,030	,473	-,630	-,208	<b>,777*</b>		-,086	,647	-,124	-,188	,215
Usefulness	<b>,873**</b>	,625	-,172	<b>,980**</b>	,184	-,086		,172	<b>,969**</b>	<b>,982**</b>	<b>,879**</b>
Multi-functionality	,107	<b>,832*</b>	-,669	,112	<b>,898**</b>	,647	,172		,075	,121	,411
Aesthetically Pleasing	<b>,847**</b>	,545	-,083	<b>,980**</b>	,165	-,124	<b>,969**</b>	,075		<b>,983**</b>	<b>,885**</b>
Durability	<b>,881**</b>	,562	-,043	<b>,991**</b>	,141	-,188	<b>,982**</b>	,121	<b>,983**</b>		<b>,862**</b>
Social Enabling	<b>,806*</b>	<b>,813*</b>	-,298	<b>,879**</b>	,540	,215	<b>,879**</b>	,411	<b>,885**</b>	<b>,862**</b>	

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

Tabla 4. Correlations between Product-related qualities

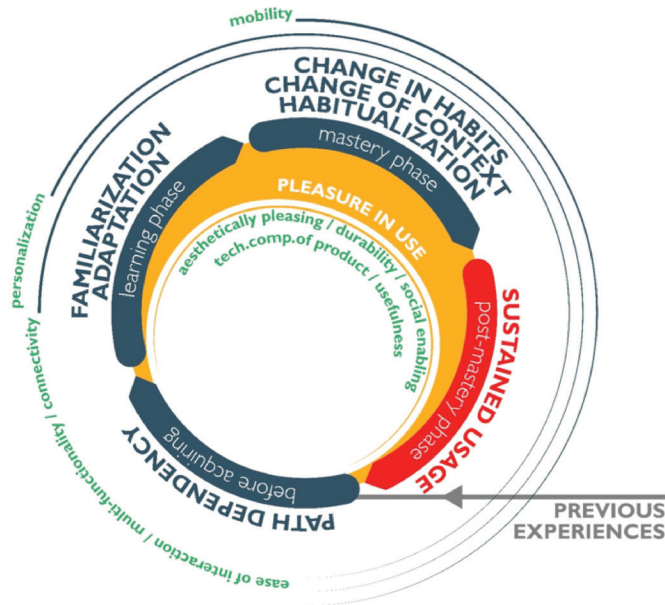


Figure 10. Path to sustained usage

changes in pleasure in use throughout the use phases and product-qualities affecting it additionally (i.e. *technological competence of product, usefulness, aesthetically pleasing, durability, social enabling*). This path suggests a continuous cycle of use phases, as the new user experience results in sustained usage, it also creates its own path dependency for the next user experience.

As opposed to studying just the experience of the user with the technological product, we suggest that the technological product experience is first confronted with people's previous experiences with a similar product, and achieves its own dependency through sustained usage (Dewey, 1938). Later on (i.e. *learning phase*) the user actually realizes the possibilities the product offers (i.e. *familiarization*) and its effects on his/her daily life (i.e. *adaptation*). While ease of interacting with the product, its ability to perform various tasks and its intermediary role for connecting to various networks are fundamental to breaking such an attachment to previous experiences, fitting to the users' preferences/desires/etc. also supports this detachment. Upon this detachment from previous experience and adoption of the new (i.e. *mastery stage*), changing the previous habits of the user (i.e. *change in habits*), extending the experience toward new and previously not-possible contexts (i.e. *change of context*), and becoming a part of the daily life (i.e. *habitualization*) witnesses a simultaneous peak in pleasure in use, which may require additional product-related qualities (i.e. *technological competence of product, usefulness, aesthetically pleasing, durability, social enabling*). It is only after this (i.e. *the post-mastery phase*), the product achieves sustained usage and achieves a dependency towards a future novelty.

The model presented here is different from the models of Kuru (2013), and Karapanos et al. (2009), in the sense that our model takes into account previous experience effects

on the new experience and the changes in pleasure in use throughout the use-phases. This conclusion in our model is rather similar to the model of Bodker et al. (2012) regarding the macro level of user experience in the sense that the user's life expands with the product, rather than the product being integrated to it. Achieving sustained usage suggests becoming an integral part of the user's life, and thus the newly formed dependency towards it. Ours is also different from other models in the sense that we tried to explain each phase of experience with product and human related qualities from which the designers can further interrelate while designing.

In the light of these, we suggest that designers of future technological products can benefit from our model, especially when innovative products that challenge existing technological products are in question. Adoption of a product and achieving sustained usage include multi-dimensional and complex relations between various qualities, human and product-related. Our model simply presents how these relations are formed, in an affecting-affected fashion, so that designers can build upon it for future technological projects.

## CONCLUSIONS

In this paper, we construct an initial model to understand how a technological product surpasses the dependency to previous experiences and how it achieves a dependency of its own, through sustained usage. We stated that sustained experiences with technological products involve complex relations between affecting product-related and affected human-related qualities, while established on certain qualities. We presented an initial model to simply explain the relations between those qualities. We believe that our model can contribute to the literature as it discusses how people have experienced personal technological products, and what led them to have positive experiences with those.

We think that the model that we have presented in this paper can be a starting point for further investigation of the relations between human and product related qualities in each phase of experience. For further studies, this initial model should be further investigated in detail by researching upon how these product-related qualities affect these use-phases individually. For example, this path to sustained usage sheds light upon the relation between 'mobility' and 'habitualization' having a strong relation. Looking back at the interviews, they generally selected mobile devices to talk upon as well. This needs to be closely studied in order to better understand how and why there is such a strong relation.

## REFERENCES

Bodker, S., and Christiansen, E. (2012) 'Poetry in motion: appropriation of the world of apps', paper presented at the *Proceedings of the 30th European Conference on Cognitive Ergonomics*, Edinburgh, United Kingdom, August 28 - 31, 2012

- Chitturi, R., Raghunathan, R., and Mahajan, V. (2008) 'Delight by design: the role of hedonic versus utilitarian benefits', *Journal of Marketing*, 72, (3), pp.48-63.
- Cila, N., and Erbug, Ç. (2008) 'The Dimensions of Users' Fun Experiences with Consumer Products', paper presented at the 6th Conference on Design and Emotion, Beijing, 6-9 October, 2008
- Crilly, N., Maier, A., and Clarkson, P. J. (2008) *Representing Artefacts as Media: Modelling the Relationship Between Designer Intent and Consumer Experience*. *International Journal of Design*, 2(3), 15-27.
- Ouden, E. D., Yuan, L., Sonnemans, P. J. M., and Brombacher, A. C. (2006) 'Quality and Reliability Problems from a Consumer's Perspective: an Increasing Problem Overlooked by Businesses?', *Quality and Reliability Engineering International*, 22, (7), pp.821-838.
- Desmet, P., and Hassenzahl, M. (2012) 'Towards happiness: Possibility-driven design', *Human-Computer Interaction: The Agency Perspective*, SCI 396 . ,pp.3-27.
- Dewey, J. (1938) *Experience and education, The Kappa Delta Pi lecture series*. New York: Macmillan Company.
- Forlizzi, J., and Battarbee, K. (2004) 'Understanding experience in interactive systems', *Proceedings of the 5th conference on Designing interactive systems: processes, practices, methods, and techniques*. Cambridge, MA, USA: ACM, pp.261-268.
- Hassenzahl, M. (2003) 'The Thing and I: Understanding the Relationship Between User and Product', in M. A. Blythe, K. Overbeeke, A. F. Monk and P. C. Wright (Ed.), *Funology*. Netherlands: Springer, pp.31-42.
- Hassenzahl, M. (2007) 'The hedonic/pragmatic model of user experience', in A. V. Effie Lai-Chong Law, Marc Hassenzahl, and Mark Blythe (Ed.), *Towards a UX Manifesto*. Lancaster, UK: COST294-MAUSE Workshop, pp.10-14.
- Hassenzahl, M. (2008) 'User experience (UX): towards an experiential perspective on product quality', *Proceedings of the 20th International Conference of the Association Francophone d'Interaction Homme-Machine*. Metz, France: ACM, pp.11-15.
- Hassenzahl, M., and Tractinsky, N. (2006) 'User experience - a research agenda', *Behaviour & Information Technology*, 25, (2), pp.91-97.
- Hassenzahl, M., and Ullrich, D. (2007) 'To do or not to do: Differences in user experience and retrospective judgments depending on the presence or absence of instrumental goals', *Interacting with Computers*, 19, (4), pp.429-437.
- Jordan, P. (2000) *Designing pleasurable products: An introduction to the new human factors*. London: CRC Press.
- Karapanos, E., Zimmerman, J., Forlizzi, J., and Martens, J.-B. (2009) 'User experience over time: an initial framework', paper presented at the Proceedings of the 27th international conference on Human factors in computing systems, Boston, MA, USA, 4-9 April, 2009-
- Krippendorff, K. (2004) *Content Analysis: An introduction to Its Methodology* (Second ed.). USA: Sage Publications, Inc.
- Kuru, A. (2013) *Exploration of user experience of personal informatics systems*. PhD Thesis, Middle East Technical University, Ankara, Turkey.
- Nicolas, J. C. O., Aurisicchio, M., and Desmet, P. M. A. (2013) 'Designing for anticipation, confidence, and inspiration', paper presented at the Proceedings of the 6th International Conference on Designing Pleasurable Products and Interfaces, Newcastle upon Tyne, United Kingdom, 3-5 September 2013
- Schrepp, M., Held, T., and Laugwitz, B. (2006) 'The influence of hedonic quality on the attractiveness of user interfaces of business management software', *Interacting with Computers*, 18, (5), pp.1055-1069.
- Vermeeren, A., Kort, J., Cremers, A., and Fokker, J. (2008) 'Comparing UX measurements, a case study', paper presented at the Proceedings of the International Workshop on Meaningful Measures: Valid Useful Experience Measurement, Reykjavik, Iceland, June 18 June 2008 .
- Vermeeren, A., Law, E. L.-C., Roto, V., Obrist, M., Hoonhout, J., V, K., Vaananen-Vainio-Mattila (2010) 'User experience evaluation methods: current state and development needs', paper presented at the Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries, Reykjavik, Iceland, 16-20 October 2010