RESEARCH THROUGH DESIGN FOR CHRONIC TIME PRESSURE: AN EXPLORATORY STUDY FOR IMPROVING SUBJECTIVE WELL-BEING OF PEOPLE WHO SUFFERS FROM TIME PRESSURE AND TIME SCARCITY

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RESEARCH THROUGH DESIGN FOR CHRONIC TIME PRESSURE: AN EXPLORATORY STUDY FOR IMPROVING SUBJECTIVE WELL-BEING OF PEOPLE WHO SUFFERS FROM TIME PRESSURE AND TIME SCARCITY

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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ABSTRACT

RESEARCH THROUGH DESIGN FOR CHRONIC TIME PRESSURE: AN EXPLORATORY STUDY FOR IMPROVING SUBJECTIVE WELL-BEING OF PEOPLE WHO SUFFERS FROM TIME PRESSURE AND TIME SCARCITY

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Frantic pace of time is a widespread problem experienced by people from different segments of the society in different countries. It leads the feeling of not having enough time for neither satisfying the needs nor doing the wants and it also obstructs the way people distinguish what matters to be committed in life or to fulfil their life goals. Therefore, overcoming this chronic time starvation has a crucial role in enhancing human flourishing and increasing the quality of time. The aim of this study is to inform design practice by guiding designers to develop products or services for people, who suffer from chronic time pressure, in order to empower them to improve their subjective well-being. For this purpose, this phenomenon was explored by using research through design approach involving four stages. The first stage included literature review on chronic time pressure, relation between mind and time and coping strategies for time pressure. At the second stage, explorative interviews were conducted to understand time perception of people in their daily lives and it helped to define the strategies used against the chronic feeling of time pressure and time shortage. In addition, current time related design and concepts are explored in this stage to discern possible design solutions. At the third stage, the findings from

previous stages guided to define the requirements for a product which would empower people suffering chronic time pressure. One final product proposal is generated according to determined requirements and produced to test with actual users. In the fourth stage, the product proposal tested with 10 people in order to explore possible ways to adapt determined requirements into design concepts. The findings are summarized and proposed as a guidance for designers who would design to empower people who suffer from chronic time pressure in order to improve their subjective well-being.

Keywords: research through design, subjective well-being, chronic time pressure, positive design

ÖZ

KRONİK ZAMAN BASKISI İÇİN TASARIM YOLUYLA ARAŞTIRMA: ZAMAN BASKISI VE YOKSUNLUĞU ÇEKEN İNSANLARIN İYİ OLUŞ DURUMLARINI İYİLEŞTİRMEK İÇİN KEŞİFSEL BİR ÇALIŞMA

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Hızlı yasam temposu, birçok ülkede toplumun farklı kesimleri tarafından hissedilen yaygın bir problemdir. Bu durum; insanlarda, var olan ihtiyaçlarını gidermek, amaçlarını elde etmek ve hayallerini gerçekleştirmek için yeterli vaktin olmadığı hissini yaratıyor, bunun yanında, insanların hayattaki önceliklerini, isteklerini ve beklentilerini fark etmelerini engelliyor. Bu nedenle bu hissin üstesinden gelmek, insanların hayat kalitelerini yükseltmek ve refahlarını sağlamak açısından büyük önem taşıyor. Bu çalışmanın amacı, zaman baskısından muzdarip olan insanlara yönelik ürün veya servis tasarlamaları için tasarımcıları yönlendirerek tasarım sürecini bilgilendirmektir. Bu amaçla, bahsedilen fenomen, dört kısımdan oluşan bir araştırmayla incelendi. İlk aşamada kronik zaman baskısıyla ilgili mevcut alanyazın tarandı. Bu aşama zaman algısının nasıl oluştuğu, nasıl manipüle edilebileceği ve zaman baskısına yönelik nelerin strateji olarak kullanabileceği konusunda bilgi verdi. İkinci aşamada zaman baskısı yaşayan insanlarla yapılan görüşmeler yoluyla onların bu konuda sahip oldukları stratejilerin belirlenmesi sağlandı. Ayrıca, bu aşamada mevcut ürün ve konseptler incelenerek potansiyeli olan çözüm alanları belirlendi. Üçüncü aşamada diğer iki aşamada elde edilen verilere göre zaman baskısını önlemeyi amaçlayan bir ürünün ne gibi özelliklere sahip olması gerektiği belirlendi ve bir örnek

ürün tasarlandı. Dördüncü aşamada bu ürün 10 kullanıcıyla test edilerek, belirlenen gerekliliklerin ürüne adapte edilirken nelere dikkat edilmesi gerektiği belirlendi. Bu bulgular özetlenerek kronik zaman baskısından muzdarip insanlar için tasarım yapmak isteyen tasarımcılar için öneriler hazırlandı.

Anahtar Kelimeler: Tasarım yoluyla araştırma, öznel iyi oluş, kronik zaman baskısı, pozitif tasarım

To my Family

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CHAPTER 1

INTRODUCTION

1.1. Background

Tradition of time keeping has changed through years according to the changes of people's needs and their daily lives. While time pieces were being transformed, the perception of time was also changing. Nature based time sense evolved into clock-based perception. After industrialization, clocks acquired great power on people's daily lives because of the need to standardize the actions of people. Clocks, which previously seen only as public centerpieces, started to enter people's homes and eventually became closest things to them after the emergence of wristwatches. This evaluation also affected how people experience time (Levine, 1997).

Nowadays, frantic tempo and experiencing the feeling urgency are the predicaments of modern life. Recurrent feeling of time shortage started to plague daily lives of people. Many studies from diverse disciplines show that this chronic feeling is a worldwide problem and has effects on the quality of life in different ways (Eriksen, 2001; Zuzanek, 2004; Steger, 2006; Adam, 1995). It prevents people from doing things important for them by leading the sense that they do not have enough time for anything (Rudd, Vohs and Aaker, 2012). This affects their social relationships by preventing people to spare time for facilitating relations with people. Moreover, it causes problems on physical health in different ways, such as, causing high blood pressure, heart diseases, insomnia. In addition, the constant mental state of time pressure leads the mood 'bareness' or 'emptiness' and it affects also psychological health (Ulmer and Schwartzburd,1996). Therefore, this phenomenon is an attractive subject for different disciplines for years and many diverse studies promote theories and strategies to understand and cope with this phenomenon.

Although, this phenomenon is considered as a time allocation problem by some of the studies, there are many studies claim that the experience of time pressure is a self-deceptive and illusory phenomenon and the perception about time and the expectations of people are the causes of this feeling (Robinson and Godbey,1999; Szollos, 2009; Schwartz, 2004; Gleick,1999; Putnam, 2000; Hassan and Purser, 2007; Eriksen, 2001; Goodin, Rice, Bittman and Saunders, 2005) (Section 2.2.1.). Therefore, raising awareness about this phenomenon is also crucial to empower people who suffers from chronic time pressure. There are some movements, such as slow living, slow technology, slow design, slow fashion, that arose awareness about hectic pace in people's lives. However, many people fail to apply suggested life styles before reaping the benefits of it because of the amount of effort and dedication required to be integrated into daily lives. Therefore, there is a need to integrate strategies into daily lives to cope with chronic time pressure.

1.2. The Relation Between Chronic Time Pressure and Design

The concept of time is a popular subject also in design field. There are many different time related designs from the ones interpret current time pieces and create a new representation of time through the ones aim to establish a discussion about time in conceptual level. Although, there are designs which focus on changing the interaction with time, there is no any product which focuses on chronic time pressure.

Design has a power to create experiences and promote daily lives of people through products and services (Gaver, 2012). 'Positive design' field focuses on how to improve subjective well-being of people and communities by using daily opportunities to create positive experiences (Desmet and Hassenzahl, 2012). It proposes three components as the ingredients of subjective well-being that are momentarily pleasures, personal significance and virtuous living (Desmet and Pohlemeyer, 2013) (Section 2.4.). These three components guide designers to design products or services which explicitly focus on contributing to the subjective well-being of people and communities.

Chronic time pressure has effects on these three components of subjective well-being as mentioned in Chapter 2. However, there is no any study about this phenomenon in 'Positive Design' field to guide designers. Therefore, there is a need to investigate chronic time pressure phenomenon to provide a source for designer who would like to contribute the subjective well-being of people who suffers from chronic feeling of time pressure or time shortage by empowering them through designs or services. In order to understand how this study used by the designers, who design for improve the subjective well-being, this section presents an overview about subjective well-being and 'Positive Design' field.

1.2.1. Positive Psychology and Positive Design

Seligman (2011) asserts that happiness is not one specific state, therefore, he indicates it as well-being. Well-being is a broad term. As indicated by Desmet and Pohlemeyer (2013), the studies classify this broad term in two interrelated concepts. The first one is objective well-being (OWB) that consists of universal external conditions increasing the quality of life such as housing, adequate nutrition. The second concept is subjective well-being (SWB) which includes personal values about what is a 'good' life (Desmet and Pohlemeyer, 2013). Diener (2000) states that subjective well-being is related with one's cognitive and affective evaluations about his/her life. In this thesis, the term 'subjective well-being' refers to happiness which is long term appreciation for one's life enhanced through personal assessment and values.

After the popularization of the term 'positive psychology' by Seligman and Csikszentmihalyi (2000), empirical studies on happiness came into prominence and researchers started to focus on how the quality of life can be increased (e.g. Diener, 2000; Lyubomirsky , 2008; Lopez and Snyder, 2009; Seligman, 2005; Seligman, 2011; Ho, 2013; and Csikszentmihalyi, 2004) rather than only neutralizing the negativity in people's lives.

Positive psychologists focus on 'What makes the life worth living' (Snyder and Lopez, 2009) and studies address the conditions and processes for human flourishing and

well-being. Biswas-Diener (2009) highlights that happiness is connected with 'what people do with their resources' rather than what they have. Seligman (2011) also argues that happiness is more related with personal values rather than material wealth and he identifies five elements which contribute well-being of people independently. These five elements are positive emotions, positive relationships, engagement, meaning and accomplishment.

In 2007, Lyubomirsky indicated that 40% of the happiness is governed by the activities which a person purposefully involved. This introduced that the level of happiness can be increased through experiences. Thus, a new opportunity and challenge, 'design for happiness', emerged for design field that is to see the products and services as resources of happiness enhancing activities.
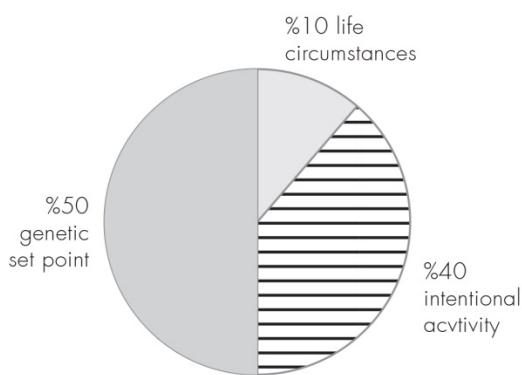
Figure 1.1. The happiness chart which shows the components of happiness

(Lyubomirsky, 2007)

'Affectivity' is the ingredient of experiences (Forlizzi and Battarbee, 2004; Desmet and Hekkert, 2007; McCarthy and Wright, 2004; Hassenzahl, 2010) which connects design with happiness (Hassenzahl, Eckoldt, Diefenbach, Laschke, Len , and Kim, 2013). Since, experiences have an 'emotional thread' (McCarthy and Wright, 2004), design can facilitate meaningful experiences which promote happiness.

'Positive design' term is introduced by Desmet and Pohlemeyer (2013). The word 'positive' refers to 'positive psychology' (Seligman and Csikszentmihalyi, 2000) and

'positive, 'possibility-oriented approach' (Desmet and Hassenzahl, 2012). The term indicates all kinds of design initiatives that aim to contribute long-term happiness and subjective well-being of people and communities. 'Design for happiness' focus on creating daily opportunities for positive and meaningful experiences (Hassenzah.et. al, 2013). The 'explicit focus' on 'design for human flourishing' distinguishes positive design from other design practices which contributes well-being unintentionally.

Positive design framework proposed by Desmet and Pohlemeyer (2013) includes three components of positive design which are the ingredients of subjective well-being. The first component is 'design for pleasure' which indicates subjective well-being enhanced through momentarily pleasures. The second one is 'design for personal significance' which focuses on personal meaning and one's long and short-term goals to achieve happiness. The third component is 'design for virtue' which contributes virtuous living and behaviour. These three components guide designers to contribute to subjective well-being.
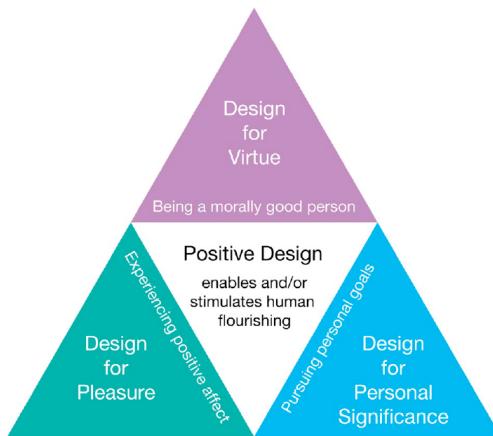
Figure 1.2 Positive Design Framework (Desmet and Pohlemeyer, 2013)

As mentioned before, chronic time pressure affects one's quality of life in different ways. When the consequences of chronic time pressure are considered in terms of the positive design framework, it reveals that this recurrent feeling of time pressure also affect the three components of subjective well-being. Therefore, it is crucial to prevent this chronic feeling for designers who wants to contribute subjective well-being by

designing for these components. However, there is no any study in positive design field about this phenomenon. Therefore, this study aims to provide a source and guide the designers who 'design for happiness'.

1.3. Aim and Research Questions of The Study

The aim of the study is to investigate the chronic time pressure phenomenon to provide a guidance for designers who would develop products or services for people, who suffer from chronic time pressure, in order to empower them to improve their subjective well-being. Since, the design field lacks studies which aggregate the knowledge about experience of time enhanced in other fields to guide designers who would research or design for this phenomenon. To investigate this phenomenon 'Research through Design' approach is used because of the complexity of the problem. This approach is popularized by HCI community because of the need to solve complex problems, which involves many different stakeholders; such as societal problems. This approach uses the nature of design practice that enables to deal with independent factors and integrate different perspectives and theories from other fields (Gaver, 2012). Therefore, 'Research through Design' method enabled to consider and combine different factors through design activities and helped to have a holistic overview during the study.

The study purposes, firstly, to explore the context of chronic time pressure to understand which factors cause this negative experience and what can be used as strategies to cope with this chronic feeling of time pressure and time shortage. Secondly, it aims to demonstrate possible ways to adapt these strategies to products in order to guide designers about potential solutions for future products or services which would empower people against chronic time pressure.

 The population of the study consists of people living with clock time and feeling time pressure chronically in their lives. Research questions are demonstrated below.

Main research question:

> How can design empower people who suffer from chronic time pressure in order to improve their subjective well-being?

In order to answer the main question, the following sub-questions are asked:

> What are the strategies to overcome chronic time pressure?

> What are the requirements for a product or a service to empower people, who suffer from chronic time pressure to improve their subjective well-being?

> How the requirements for a product or a service to empower people, who suffer from chronic time pressure can be adapted to a product?

1.4. Structure of The Thesis

The thesis includes 7 chapters. The contents of the chapters are outlined below.

Chapter 1 explains briefly the context of chronic time pressure, it's relation with positive design field, the aim and the population of the study. The structure of the thesis is introduced at the end of this chapter.

Chapter 2 demonstrates chronic time pressure through the perspectives of different fields. Firstly, the history of time keeping explains how the perception about time has changed and time pressure started to enter daily lives of people. Secondly, chronic time pressure and time experience is introduced. After explaining the reasons and results of chronic time pressure, the concept of subjective time experience is illustrated. It is showed that how perceived time can be manipulated and what are the strategies proposed in the literature.

Chapter 3 explains the methodology of the study in detail. Firstly, it introduces 'Research through Design' approach, then it illustrates how this study used this methodology by explaining the phases of the study. The ways to generate knowledge and how the findings are iterated also described in this chapter.

Chapter 4 presents preliminary studies, which are the explorative interviews and the analysis of current product and concepts. The method and the results of the interviews are mentioned in this chapter. Moreover, the insights which leads the design phase are demonstrated.

Chapter 5 illustrates the steps of design phase. Initial idea generation, the defined requirements for the products which would empower people, who suffer from chronic time pressure, final product proposal and how the prototype of it is developed are presented in detail in this chapter.

Chapter 6 introduces the evaluation study which is the last step of the study. The aim of the evaluation study, the tested aspects of the proposed concept, the sample of the study, the procedure of the study and the results of the study introduced in this chapter. The potential or drawbacks of proposed concept is discussed in terms of the ways of adapting the requirements determined in chapter 5.

Chapter 7 summarized the study. It evaluates the research questions and proposes a guidance for designers who would design products or services to empower people who has chronic feeling of time pressure and time shortage. Moreover, the recommendations for further studies according to the findings are also introduced at the end of this chapter.

CHAPTER 2

LITERATURE REVIEW

Chronic time pressure is a phenomenon which requires an integration of knowledge from different disciplines in order to understand and reframe this problematic situation. Therefore, a diverse literature review is crucial on time related studies conducted in by different disciplines.

In this chapter, firstly, the history of timekeeping is introduced to discern when the time pressure started to occur in daily lives and what agents caused this negative experience. Afterwards, the results of chronic time pressure and suggested strategies overcome this phenomenon is presented in order to demonstrate the why there is a need for exploring this phenomenon further.

2.1. The History of Time Keeping

Changes on time keeping tools and their capabilities have affected the perception about time through history. Therefore, investigating how the tradition of time reckoning change through history would help to disclose how time keeping passed beyond just marking events through dictating the cadence of daily life.

Levine (1997) provides an overlook on how tradition of time keeping evaluated from nature-based experience through more clock-based tradition in his book 'A Geography of Time'. In this book, he emphasizes that before industrialization, demands of nature were ruling the daily life and guiding activities, such as time to plant and harvest or time to sleep and wake up. Early time pieces were using natural events to divide time into units. For example, the ancient Egyptians were using a 'nilometer', which measures the water level of Nile River, as a calendar for agricultural activities. By this way, they were able to estimate famine or flood periods. In addition, ancient

astronomers were appointing the years and months in a certain level by appointing the phases of the moon. Aside from these ancient tools, the invention of sundial clocks made people able to measure day and night. Thus, people, for the first time, became able to mark events and make appointments. However, when there was no sun, these tools were useless. Therefore, to measure time independently from environmental changes was a crucial need. For this purpose, water clocks were used to measure the amount of dripping water from a pot to show the passage of time. Although, still, factors such as changes in viscosity of the water due to environmental conditions were preventing to assess time accurately, the invention of water clocks initiated a new period in timekeeping. Afterwards, the logic beyond water clocks inspired the invention of many other tools, such as sand and candle clocks (Levine, 1997).

Around the fourteenth century in Europe, the earliest mechanical time pieces were invented as sound bells for informing the prayer hours. These tools were not showing the time and not more accurate than water clocks, but they became the centerpieces of the community. Levine (1997) indicates that the word 'speed' in English language appeared for the first time just after the invention mechanical clocks. However, remarkable progress in timekeeping has been taken by the invention of pendulum clock in 17th century. This breakthrough invention has enabled humankind to measure hours, minutes and even seconds more precisely. Thus, synchronization of people's action and coordinated living, meetings, schedules, deadlines, has become possible (Levine, 1997). Thompson (1967) indicates that the appearance of clocks has changed the people's sense of time from task oriented to clock time oriented. Time pieces progressed from being centerpieces in cities through homes and even they came central to individuals' outfits with portable watches (Kahlert, Muhe, Brunner, 1986). Thus, they started to penetrate deeper into daily life and even personal spaces.

The transformation from nature time through living with clock time is not only related to technological advancements in timekeeping tools, but also related to social, economic, psychological forces and assertive marketing of time as a commodity with

the growth of industrialization. Industrialization required a change in time sense for the progress of industrial capitalism (Haworth and Lewis, 2005). The demands for coordinated and calibrated living moved clocks to an omnipotent status. Time has promoted as a valuable possession and a status symbol. 'Time is money' concept was a twist in mindset of people which boosts 'wasting time' is one of the sinful attitudes (Levine, 1997) and time started to be seen as a currency which is used, spent or wasted (Larsson and Sanne, 2005). Highly industrialized countries have started to live by clock and this promotion of time. Thus, clocks started to dominate daily life (Levine, 1997).

The history of the attitude of humankind toward time keeping reveals how the trends or patterns in time allocation and the perception of time have changed. However, to understand 'time pressure' as a phenomenon, reviewing the current literature has a crucial role.

History of Time

Industrilization

Nature dictated

Time reckoning was mostly guided by the demands of the **environment and nature**

an increasing awareness of clock time.

Gathered pace in the eighteenth century

a *change in time sense* which became an essential prerequisite for the growth of industrial capitalism.

'Time is money'

'Time is power'

'Time as a commodity'

'Time as a possession'

The new technologies demanded a previously unimagined regimentation and coordination of activities and the *clock moved to center stage!*

Time pieces have not only evolved toward greater accuracy, but have *penetrated deeper into our personal space*

the clock is not merely a means of keeping track of the hours, but of *synchronizing the actions of people*

Figure 2.1. The summary of history of time keeping part. It shows how industrialization affected time sense and the practice of time keeping (Illustration by the author)

2.2. The Experience of Time

There are many studies on experience of time in many different fields. To reveal these diverse theories about reasons and results of the feeling of time pressure is vital to have a more holistic view about this phenomenon.

Levine (1997) in his book 'A Geography of Time' defines the pace of life as the movement or flow of time experienced by people. Empirical knowledge about the experience of time is mostly enhanced through time-diary studies and surveys. These large surveys and time-diary studies conducted around the world gives data to assess the time allocation in 24 hours and private, internal time experience of people (e.g. Szalai, Converse, Feldheim, Scheuch and Stone, 1972; Eurostat, 2004; Horrigan and Herz, 2004). Many studies illustrate that the pace of life has increased through years and the experience of time in daily life is mostly hurried and rushed (Nowotny, 1994; De Graaf, 2003; Csikszentmihalyi, 1997; Gleick, 1999; Jacobs and Gerson, 2004; Robinson and Godbey, 1999; Menzies, 2005; Eriksen, 2001).

The studies about time also enable researchers to make comparisons on the experience of time nationally and internationally. The publications from Norway (Eriksen, 2001), Canada (Zuzanek, 2004; Menzies, 2005), Japan (Steger, 2006), Germany (Adam, 1995) show that 'feeling rushed all the time' and 'not having enough time' is a widespread problem. However, Szollos (2009) claims that still there is a difference between cultures in terms of their time experience. He defines technologically developed countries as clock time cultures and technologically less advanced cultures as event time cultures. According to his proposition the experienced pace of time in less technologically advanced countries, event time cultures, is radically different from the reports enhanced from highly industrialized countries, clock time cultures. One of the most fundamental differences in 'living by event time' from 'living by clock time' is marking the time through activities rather than schedules and clocks. People use their feelings and own spontaneous schedules to transpire the beginning and the endings of the events and their feelings decide to stay or leave the activity.

The time is not sharply predefined by schedules in these cultures. The beginnings and ends are more ambiguous and flexible. On the contrary, the cultures predominated by clock perceive time as linear, measurable and fixed. Mostly, the clock decides when to work and when to play. While time and money are two different entities in event cultures, clock based cultures see time as a valuable commodity. Therefore, they have 'wasting time' concept (Levine 1997). This profound discrepancy between clock time and event time cultures also causes differences in perceived pace of life. Life in technologically advanced countries living by clock more hectic and rushed than the slower experience of time in event time cultures (Levine, 1997; Norgate, 2006). The figure 2.2 indicates how time experience differs according to clock and event time cultures.

Figure 2.2. Clock and Event time Cultures. The difference between event time and clock time cultures in terms of their time experience (Illustration by the author)

2.2.1. What's Chronic Time Pressure?

Selye (1952) illustrates that time pressure is connected to emotional, cognitive and physiological 'strain' comprised the human stress response. It includes emotional experience of accelerated pace and rushing and cognitive awareness of time deficit and not having enough time. The recurrent and unavoidable time pressure in one's daily life is considered as chronic time pressure. This chronic, repetitive feeling 'running out of time' and time shortage is different from acute time pressure which is a momentary and specific phenomenon. Chronic time pressure comprises two overlapping components which are chronic time shortage and constantly being rushed.

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Chronic time shortage is measurable, objective problem related to time allocation. However, being rushed is a subjective experience of issues, such as frantic tempo, demands of accelerated processes, deadlines and tight schedules; and it has also an emotional dimension that causes frustration, anxiety and worry (Szollos, 2009).

Despite the studies presenting time pressure as a pervasive problem experienced by the entire culture (Larsson and Sanne, 2005), there are many studies which claim the experience of time shortage is a self-deceptive and an illusory phenomenon. To illustrate, Robinson and Godbey (1999) reveal the contradiction between the internal time experience of Americans through time-diary results. Despite declining working hours and increased free time, most of Americans perceive the pace of life more hectic and they feel rushed, stress more than before. The experience of frantic tempo leads to perceive working hours longer and causes the feeling of 'running out of time' (Szollos, 2009). Schwartz (2004) correlates the feeling of time shortage with increased free time and growing number of choices causing a 'paradox of affluence'. Gleick (1999) also address the experience of time shortage as an illusion created by increased options. Lack of time to pursue all hedonistic options leads the feeling of time shortage (Putnam, 2000; Goodin et al., 2005). Advances in technology accelerated many processes and the sense of time reshaped by 'network and software speed'. Concomitant results of the expectation of speeding up every process generated a sense of time urgency and an impatient experience of feeling rushed (Eriksen, 2001; Hassan and Purser, 2007).

2.2.2. The Effects of Chronic Time Pressure

The change in perception of time influences the quality of time in many aspects. Anxiety disorders such as, 'generalized anxiety disorder', 'panic disorder', and 'social phobia' are mediated by chronic time pressure (Aho, 2007). Teuchmann, Totterdell and Parker (1999) indicate that perceived time pressure directly related to negative mood and indirectly linked with exhaustion. In addition, worry, anxiety, and frustration are severe emotional dimensions of being rushed (Szollos, 2009).

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Furthermore, Roxburgh (2004) evidences that the high subjective time pressure is considerably connected with depression. Leisure studies assert the connection between well-being and time shortage (Haworth and Veal, 2004; Brown and Kasser, 2003).

Gergen (1991) states that accelerated living generates the feeling of being overwhelmed and defeated rather than giving exhilarating satisfaction. This feeling occurred by hectic pace of life is defined as 'hurry sickness' which refers to chronic and severe feelings of time urgency that have brought about changes affecting personality and lifestyle (Ulmer and Schwartzburd, 1996). Ulmer and Schwartzburd (1996) indicate that the self is affected by the experience of time pressure in terms of three detrimental ways. Firstly, chronic sensory arousal and time pressure affects physical health by causing the proliferation of emotional fatigue, heart disease, high blood pressure, obesity, insomnia, and tendency toward rage and hostility. Secondly, it affects social and interpersonal relationships by fracturing relations with family, friends and loved ones. The fragmented emotional support system, which requires time to sustain and develop, leads the feeling of isolation and loneliness. The final ramification of time pressure is on psychological level. The chronic mental state of hectic pace of life causes a mood defined as 'a personal, perhaps even spiritual, barrenness or emptiness' and 'covert self-destructive behaviours' (Ulmer and Schwartzburd, 1996).

To feel the state of hurriedness and the chronic experience of lack of time also prevents to distinguish what matters to be committed in one's life and affects the choices in the way of living (Rudd, Vohs and Aaker, 2012). It obstructs to make future plans and fulfilling the life goals (Eriksen, 2001) and initially people become indifferent (Aho, 2007). Therefore, to restrain chronic time pressure is vital also due to stimulate human flourishing which is the explicit focus of positive design.
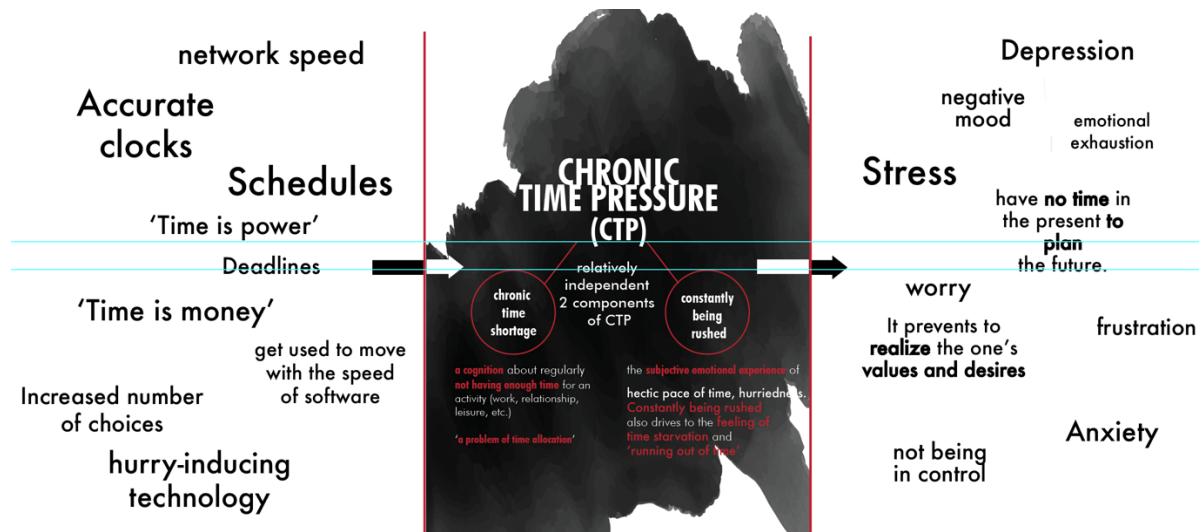
Figure 2.3. The summary of the literature research. (Illustration by the author)

Figure 2.3. summarizes the findings from the literature about time pressure concept. The left shows the proposed reasons which leads the feeling of chronic time pressure. The right side indicates the results of this phenomenon. The middle parts introduce the two independent components of chronic time pressure.

2.2.3. Subjective Time Perception – Experienced and Remembered Duration

Why sometimes time feels longer and sometimes seems shorter. Different disciplines provide theories to reveal the relationship between the mind and time. This section explains why an objective time duration is perceived subjectively and how it changes and how it can be manipulated. Since, it is vital to understand the mechanism behind our time perception to discern if it is possible to make the time seem longer than actually it is in order to help people who suffer from time starvation, which is an emotional experience of chronic time pressure indicated in previous sections.

Many studies provided theories and strategies to understand how perceived duration differs and can be manipulated. Psychology and cognitive science literature are crucial to understand how we perceive time. Eagleman (2008) indicates that the main difference between experienced duration and objective time comes from the fact that people 'perceive' time through brain rather than sensing it. In other words, time can

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be seen as a product of the brain generated by the brain's judgments according to the information collected during that period of time. There are different variables, such as, contextual changes or attentional processes which affects the duration judgment of brain (Block and Zakay, 2004; Eagleman and Holcombe, 2002). Therefore, Eagleman (2008) proposes that temporal judgements are subjective and different than clock time. Moreover, they can be distorted easily.

The first distinction in time sense is proposed James in 1890. He indicated that the perceived duration differs as 'prospective' and 'retrospective' sense of time. This distinction is still used while comparing estimated duration as 'the prospective paradigm' and 'retrospective paradigm'. In 'prospective paradigm', the duration estimation done by the person who knows during the period of time that the duration will be estimated. However, 'in retrospective paradigm' participants do not know that their judgment will be asked about duration until certain amount of time passes (Block and Zakay, 1997). Block (1990) uses the terms 'experienced duration' for prospective paradigm and 'remembered duration' for retrospective paradigm. In this study, the terms 'experienced duration' and 'remembered duration' are used to describe 'prospective and 'retrospective' sense of time.

The perceived duration is a function of processing of stimulus by brain (Tse, Intriligator, Cavanagh, 2004) and studies show that there are different variables which affects time sense in two ways which are 'experienced' and 'remembered' duration. However, there are also some variables that affects 'retrospective duration' but not 'prospective perception', such as segmentation of information (Zakay, Tsal, Moses and Sharar 1994). Zakay and Block (2004) indicate that the difficulty in processing information, which is a major factor that affects 'prospective duration', has no or little influence on 'remembered duration' (Block and Zakay 1996). In order to be able to manipulate the perceived time duration, it is important to understand the variables which has effects on 'experienced' and 'remembered' time separately.

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The experienced duration is judged by brain through temporal and non-temporal information enhanced during that period of time (Block and Zakay, 2004). Pouthas and Perbal (2004) indicates that prospective time judgements are related with attention as proposed in earlier models of prospective duration (e.g., Kahneman,1973; Thomas and Weaver, 1975; Treisman, 1963). Tse et al. (2004) also indicates that 'temporal cues', which processed by brain, determines the perceived duration. It is proposed that when attention is distracted by non-temporal information and the number of temporal cues processed decrease duration is perceived less than it is (Kahneman,1973; Tse,2004). If attention and assessment capacity is not distracted or temporal information process is boosted, more temporal information is processed perceived duration increases (Tse et al., 2004). This means when a person focus on a task and the capacity of the brain is used to process the information related with that task, the capacity which is used to assess the clues about time decreases. This leads the feeling time passed faster than actually it is. However, when the capacity of the brain used to process the temporal clues, time is perceived slower during that period of time and 'experienced duration' elongates at that moment. To illustrate, when people gets bored or when they wait for something, they feel time passes slower than its normal pace. The reason of this, the brain can process more clues about time because of being not engaged with another task, thus the 'experienced' time feels longer.
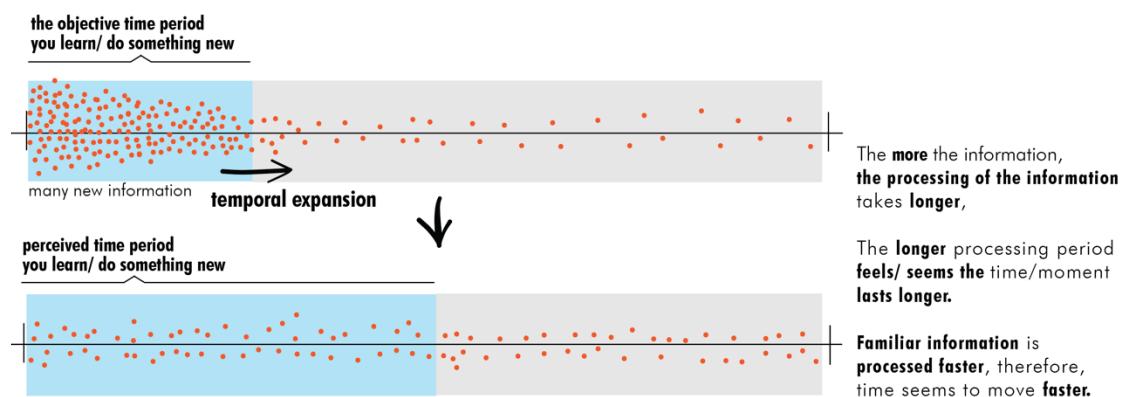
Figure 2.4. Elongated 'remembered' duration. (Illustration by the author)

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Studies also shows how 'retrospective duration' can be manipulated. Ornstein (1969) proposes that the amount of storage used for the information processed during that period of time assigns the perception about the duration. Another memory-based model shows that increased contextual changes, which are environmental, emotional, and other contextual elements, cause to perceive 'remembered' duration elongated (Block 1989, Block and Reed 1978).

In conclusion, as indicated by Stetson, Fiesta and Eagleman (2007) the perceived duration of an objective time period is a construction of the brain and it can be manipulated. If the information new or many, the processing of the information takes more energy and the remembered duration feels longer as illustrated in the figure 2.4. The literature proposes that focusing on the moment can elongates the 'experienced' time duration because of increasing the processed temporal clues. Moreover, being aware of details, breaking routines, experiencing new things and injecting novelty into daily lives are crucial to elongate perceived duration by increasing the amount of processed information or by increasing the new information which takes more effort to be processed. These principles proposed by psychology and cognitive science literature coincide with the strategies suggested in the literature to cope with the feeling of time pressure.

2.3. Strategies to Cope with Time Pressure

Chronic time pressure is a phenomenon which affects people's lives in terms of many different aspects. As mentioned before, it does not only affect physical and psychological health, but also it influences subjective well-being and quality of life. Therefore, there are many studies in many different fields that tries to provide suggestions to overcome this phenomenon and make people to feel they have a control over time. In addition to academic literature, there are also different movements which aim to increase awareness of people about hectic pace of life and encourage them to change their life styles to prevent this feeling.

Many different movements manifest to withstand the increased pace of time and life. Slow city (Città Slow) (Mayer and Knox, 2009) aims to slow the pace of life in cities. Slow Food Movement which inspired Slow City Movement suggest more relaxed speed for how we cultivate or eat the food. Slow Technology includes designs for mental rest, interactive systems with long lifespans or less consumptive lifestyles. Honore (2005) in his book 'In Praise of Slowness' indicates that slow movements are not about doing everything slower and being against everything fast. He emphasises that slow movement is a philosophy which propose a balance between slowness and being fast. Strauss and Pais (2005) propose the word 'slow' as mental attitude which creates more space for reflection rather that referring less speed.

Slowing down the mental activities and making self-reflection can be seen as the base of the other recommendations in the literature in order to cope with chronic feeling of time pressure. Mindfulness is one of these strategies. It is described as 'bare attention' and cultivated awareness about perception (Epstein, 1995). It is also illustrated as cultivating acceptance of present moment without any judgments (Bishop, Lau, Carlson, Anderson, Carmody, 2004). Meditation is another method to cope with hectic pace of time by experiencing the moment. However, these strategies require discipline and dedicated time to learn and practice. Thus, for people who chronically have time shortage and feel that they do not have time for anything, it is not an option to spend time to learn and practice these strategies.
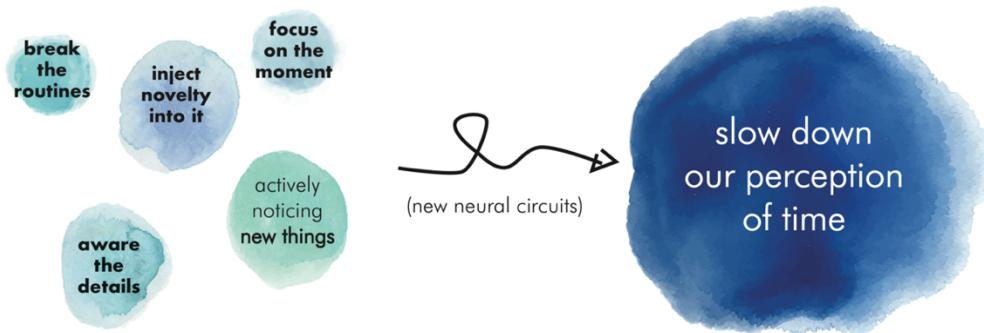
Figure 2.5. The summary of the strategies proposed in the literature.

Figure 2.5. demonstrates the proposed strategies in the cognitive science and psychology literature to slow down the time perception and elongate the perceived duration in the moment (experienced duration) and in the memory (remembered duration).

CHAPTER 3

METHODOLOGY

In this chapter, firstly the facets of 'Research through Design are presented in order to discern why this approach is used as the research method for this study. Secondly, the phases of the study are introduced.

3.1. 'Research through Design' for Chronic Time Pressure

Chronic time pressure is a complex problem which is studied by many different fields for years. As indicated in Chapter 2, although the studies compromise about the results of this phenomenon, there are different arguments about the factors that lead this chronic feeling of time pressure and time scarcity. Some studies link this phenomenon with time allocation problems, however, there are also studies which proposes that the chronic feeling of time pressure and time scarcity is an 'illusory' and 'self-deceptive' phenomenon caused by different factors as stated in Section 2.2.1. The proposed contradictory reasons prevent to recommend one 'true solution' for the problem of chronic time pressure. Therefore, in order to explore further and suggest strategies to cope with this phenomenon, rather than searching for one true solution, the ways to optimize the indicated contradictory factors should be investigated.

The nature of design practice enables to deal with different independent factors and integrate different perspectives and theories from other fields (Gaver, 2012). Hence, designerly activities are used by HCI (Human Computer Interaction) community to cope with abstract and complex problems by using 'Research through Design' approach for years. This feature of 'Research through Design' lead us to use this approach also to explore the chronic time pressure phenomenon. Before introducing the phases of this study, it is important to explain the 'Research through Design' approach and its facets in order to elucidate the reasons to use certain activities in this

study during the research process.

3.1.1. Research through Design

'Research through Design' (RtD) is recently popularized by HCI community. This approach is used by HCI field to solve complex problems, which requires a comprehensive approach, such as; societal problems. Since, this method enables to integrate different theories and perspectives by using the practices from design field and this aspect of this method makes it appropriate to explore the problems requiring a holistic approach (Gaver, 2012). To discern the reason why this method is appropriate to explore the chronic time pressure phenomenon the facets of this approach are presented below.

3.1.1.1. The Relation Between Research and Design in RtD

To understand the term 'Research through Design', it is important to understand the relation between design and research. Stappers and Giaccardi (2018) indicates that research and design activities are distinct from each other due to their way of being conducted and the way of judging the outcomes, however; they are also closely related in terms of their aim to produce something new and iterate the previous thing which is known. Frayling (1993) illustrates the relation between design and research by indicating three ways to do research for design community that are 'research into art and design', 'research through art and design', 'research for art and design'. This distinction aligns with the current separation between the roles of design activities in the generation of new knowledge indicated by Stappers and Giaccardi (2018). The first type of relation between design and research is 'Research is Design' approach which proposes that research and design activities are inseparable, and design can be seen as 'a form of research' which both results in producing knowledge (Zimmerman, 2003). The figure. 3.1 demonstrates this approach.
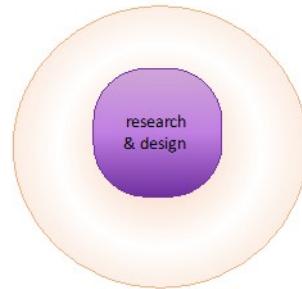
Figure 3.1. 'Research is Design' approach (Stappers and Giaccardi, 2018)

The second one is 'Research for Design' approach which refers to use research activities, such as; observations, interviews, literature researches as a part of doing design. Figure 3.2 shows how the knowledge gained through research activities is used to contribute design activities and designing in this approach.
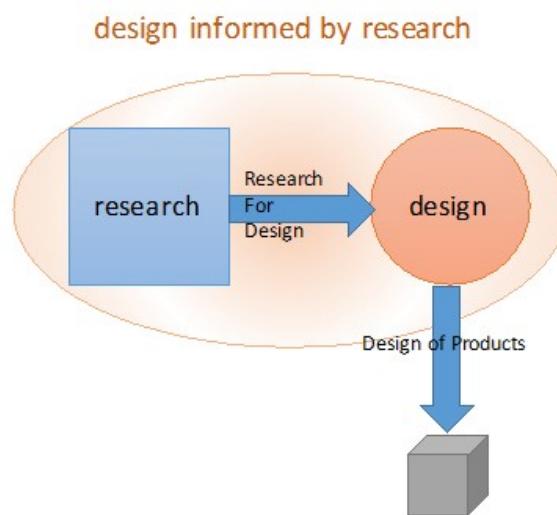
Figure 3.2. 'Research for Design' (Stappers and Giaccardi, 2018)

The difference of 'Research through Design' approach from these two approaches is to use design activities in order to generate knowledge (Stappers and Giaccardi, 2018). The figure 3.3 demonstrates how design activities contributes to research by creating stimuli or tools in the first part and the second part illustrates the formative role of the

design in knowledge generation.
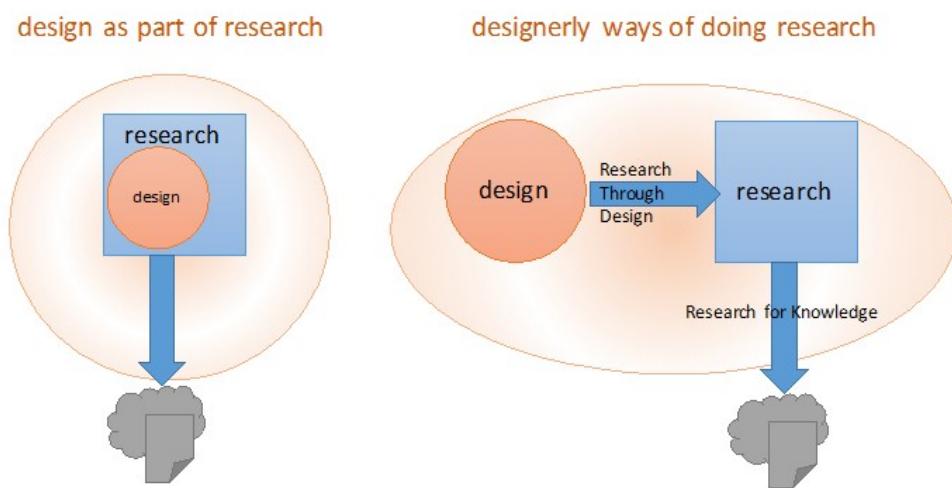
Figure 3.3. Research through Design (Stappers and Giaccardi, 2018)

To use design activities to generate knowledge constitutes the competence to deal with complex and abstract problems of this approach. This feature of RtD, caused a requisite to deal with complex and abstract problems, needed the integration of design practitioners into HCI (Human Computer Interation) research community. This growing integration of design practices into research process of HCI community popularized 'Reseach through Design' approach. The definition of 'Research through design' by Zimmerman, Stolterman and Forlizzi (2010) also emphasize this starting point as the distinct advantage of RtD which is to allow approaching unclear and messy situations by using designerly activities by 'a research approach that employs methods and processes from design practice as a legitimate method of inquiry' and This advantage of this method comes from the nature of design. Gaver (2012) indicates that design practice is used to address 'wicked problems', which is indicated by Rittel (1973). 'Wicked problems' include a complexity generated by contradictory, changing and incomplete aspects of the problem and they cannot be solved by using scientific or engineering inquires (Rittel, 1973; Buchanan, 1995). Therefore, the solution for this kind of problems is not finding the true or false but it is optimizing

the current situation (Zimmerman, Forlizzi and Evenson, 2007; Binder and Redström, 2006). This makes 'Research through Design' approach, which uses design practice to contribute the research process, proper for exploring 'Wicked Problems'. Since, design practice enables to consider and deal with many different independent factors (Gaver, 2012) and it is used to integrate different perspectives or theories from other disciplines (Zimmerman, Stolterman and Forlizzi, 2010).

Chronic time pressure phenomenon is a 'Wicked Problem' which is studied by many different fields for years. The complexity of this phenomenon in terms of its proposed contradictory and changing reasons prevents to suggest one true solution as in the other 'Wicked Problems'. Therefore, rather than trying to find the truth, how to optimize the current situation should be investigated and the approach 'Research through Design' is the most appropriate method because of the reasons mentioned before.

3.1.1.2. Activities in Research through Design Process

One of the important matters discussed in the literature is the process of doing research with 'Research through Design' method. Although, this issue has been discussed for years, there is no any specific proposed structure for doing research with this approach. However, Stappers and Giaccardi (2018) illustrates some of the activities used during RtD process. The following list introduces these activities;

- To produce a prototype and reflecting on design decisions,
- To discuss the prototype with peers in a design critic if it clarifies the research goals
- To demonstrate the artifacts in order to have the responses of the audiences,
- To deploy prototype in a field study in order to enhance situational/contextual data or the inputs of the people,
- To use prototypes as a provocation tool for about the life of people or the artifact itself

- To use prototype as means 'physical hypothesis' to prove if the proposition is feasible or not
- To confront with different framings, theories by creating an intervention
- To use prototypes in order to give a direction to the research project

Stappers and Giaccardi (2018) state that these activities are not a complete list. They can vary and change according to the project. Although, these proposed activities do not give certain steps for doing research with RtD approach, they guided the activities used in this study by showing the ways to generate knowledge (Section 3.1.2).

3.1.1.3. The Role of The Prototypes and Artifacts

The other important facet of 'Research through Design' is the role of the prototypes and the artifacts in the research process. Prototypes and artifacts, such as sketches videos, are essential ingredients of 'Research through Design' approach in terms of their ability to communicate knowledge. Stappers and Giaccardi (2018) states that the knowledge which 'cannot be communicated by mere words' can be communicated through material artifacts. Ingold (2013) also indicates prototypes and artifacts as 'the carriers of the knowledge'. They can be used to test a hypothesis by instantiating certain variables, to produce data about a certain subject, to demonstrate an abstract theory and to give a direction for studies (Wensveen and Mathews, 2014). In addition, they can help to build theories (Stappers, 2007; Koskinen, Zimmerman, Binder, Redström, Wensveen, 2011; Zimmerman, Forlizzi and Evenson, 2007; Wensveen and Mathews, 2014), can open up design spaces (Giaccardi, Speed, Cila and Caldwell, 2016) and produce knowledge and directions for new design opportunities (Sanders and Stappers, 2012). Moreover, fictional or speculative artifacts can be used to have the responses of the people about a certain issue by provoking speculations (Wakkary et al 2015). These diverse usages of the prototypes and artifacts makes one of the crucial.

3.1.1.4. Research Outcomes in 'Research through Design' Approach

'Research through Design' is used as a valid research method in HCI and IxD (Interaction Design) and there are different proposals about the form of the knowledge gained through RtD process. Höök, Bardzel, Bowen, Dalsgaard, Reeves and Waern (2015) indicates the 'intermediate level knowledge' gained through RtD can extend in between particular artifacts, such as; actual designs, and abstractions, such as; generalizations and theories. The forms of design knowledge can also be certain design solutions (Stolterman, 2008), or concepts (Höök and Löwgren, 2012), or portfolios which are annotated (Gaver and Bowers, 2012), or critics (Bardzell, Bardzell, Forlizzi, Zimmerman, Antanitis, 2012).

Gaver (2012) indicates how the output of design practice can be seen as the embodiment of the designer's judgements which addresses problems or possibilities and he argues that the reflection of them introduces a range of conceptual, procedural, topical and pragmatic insights. The physical prototypes can function to demonstrate abstract theoretical concepts or alternative combinations of the elements, however, to get insights from the prototype as a research tool, they need to be framed (Stappers and Giaccardi, 2018).

3.1.2. The Phases of The Study

How this approach guided the research process of this study is demonstrated below. The figure 3.4. illustrates the phases of the study.

The research process includes three main phases. The first phase starts with discovering the context of time pressure by exploring from different perspectives through research activities. The research process is commenced with literature research in order to clarify when the time pressure started to occur, what are the reasons and the results of it, what are the proposed strategies to cope with it and how we perceive time. In addition, design literature reviewed to reveal if there are any studies about time pressure in 'Positive Design' field, which focuses on improving

subjective well-being of people. After this divergent literature research explorative interviews were conducted with 10 Master students studied in TU Delft. 5 students were claiming they always feel time pressure in their daily lives and 5 of them was literally have busy schedule for a week. The purpose of the study was to discern if their personal time experiences can be related with the findings from literature and if there are any other strategies used to cope with the feeling of time pressure by the participants which could inspire design concepts. This interview also allowed the emerge of new themes by using inductive approach (Thomas, 2006). After this exploratory study, the current time related concepts and designs are examined and clustered in order to identify possible themes and design solutions for time pressure. This benchmark gave insights about how the theme of time is interpreted by current design and concepts. The aim was to identify if there are any designs or concepts which use the proposed strategies, or the findings recommended in the literature and how they function. In addition, it is inspected that whether there are any different approaches about time pressure which could provoke new interpretations in design phase.

After discovering the context of chronic time pressure through these iterative processes, the insights are converted as design directions for the design phase. These directions are the strategies which would be helpful to cope with chronic time pressure phenomenon. Design phase started with initial idea generation. Many different concepts are generated during this phase according to these directions. The aim was to adapt the insights and strategies, which proposed to help coping with chronic time pressure, to different design concepts. After initial idea generation phase, concepts are discussed with four specialists from positive design field. The evaluation of the concepts is done in terms of the level of the adaptation of the strategies and the level of communication of the knowledge gained through research activities. According to this evaluation, design objectives are identified in order to include all suggested strategies and insights, which would be useful to communicate in the product in terms of empowering people who experience the feeling of time pressure and time shortage

in their daily lives. These objectives are determined as the requirements that must to be met by the design concepts. New design concepts are designed according these objectives and one final concept is selected in order to make the prototype and test it with actual user in an evaluation study. The selected concept is produced through a material design process. During this process the concept revised again in order to reflect the objectives clearly according to the aspects of the prototype.

Finally, the prototype is used in an evaluation study which is conducted with 10 participants. The aim of the study was to evaluate if the prototype communicates the strategies or not. 10 participants used the final prototype for two weeks. At the end of these two weeks, semi-structured interviews are conducted. The qualitative data is analysed with inductive and deductive approach (Thomas, 2006). Firstly, if the prototype functions the objectives is investigated. Secondly, other emerged themes are analysed. Findings are summarized as results and recommendations for further studies. This iterative knowledge generation phase is introduced in next chapters.

RESEARCH ACTIVITIES
Understanding The Context of Chronic Time Pressure
Defining Strategies to Cope with Chronic Time Pressure

CHAPTER 2
LITERATURE RESEARCH

History of Time Keeping

The Experience of Time
What is Chronic Time Pressure?
(Reasons / Results)
Subjective Time Perception
(Experienced & Remembered Duration)
Strategies - Movements to Cope with Time Pressure

Design Literature
Positive Design

get bored   elongate the moment
design for slowness   be aware of the moment
break routines
elongate the memory
encourage for new experiences

be aware of time allocation

frame time with positive associations

CHAPTER 4
PRELIMINARY STUDIES

Explorative Interviews
10 Master Students
Time Perception in Daily Life
(Slow/ Fast)
Experienced - Remembered Duration
Coping Strategies

Time & Design
Comparison of Current Products and Concepts

Design Directions

DESIGN ACTIVITIES
How Design Can Help to Overcome This Phenomenon
- Requirements for the Products to Empower People to Cope with CTP
- Create a Product Proposition As A Sample

CHAPTER 5
INITIAL CONCEPT GENERATION

Initial Idea Generation
Generate Concepts
Evaluate Concepts

Define Objectives & Second Concept Generation
Evaluate Concepts and Choose One Concept

Finalize Final Concept
Evaluate Concepts and Choose One Concept

Produce Prototype
Material Design

Prototype

Evaluation of Proposed Concept

CHAPTER 6
EVALUATION STUDY

Findings

Guideline for Futher Studies

CHAPTER 7
RECOMMENDATIONS

Figure 3.4. The Phases of The Study

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CHAPTER 4

PRELIMINARY STUDIES

Before identifying design directions to use for the design process exploratory interviews were conducted to explore more about the time experience of the people who feels time pressure in their daily lives. The aim was to discern if there are any other themes in addition to the findings from literature about time experience. The explorative interviews were about experienced and remembered time duration. The insights from the interviews helped to identify design directions which are necessary for the idea generation process. In addition, the current products and concepts are examined to discern if there is any strategy used which would help to empower peole against chronic time pressure.

4.1. Explorative Interviews

Many studies in cognitive science and psychology literature on the experience of time reveals why people feel time subjectively. As mentioned in the literature review section, it is proposed that time is a function of the brain and it can be manipulated. The experienced duration of an objective time period can be elongated according to the information processing of the brain. The experienced or remembered duration can be perceived slower or faster depending on the information processed. Therefore, some strategies can be used to make the passage of time seem slower such as, breaking routines, experiencing new things. There are also different strategies recommended in the literature which helps to cope with the chronic feeling of time pressure and time starvation. It is important to identify how people, who feel the pressure of time in their daily life again and again, experience time during the day and do they have any strategies that they use to cope with it. Hence, after literature research explorative semi-structured interviews were conducted with the people, who claims that they feel

time pressure in their daily life. The aim was to understand how their personal time experiences of the participants can be related with the literature and if there are any other emerging themes. In addition, the study questioned whether these people use any strategies to cope with time pressure or not.

4.1.1. Sampling

The study conducted with 10 Master students studying at TU Delft Industrial Engineering Faculty. 5 number of the participants were selected from the students, who participated a case study trip in Berlin for a week, according to their availability. This trip was including a busy schedule proposing to work with different companies on different cases every day. Interviews were done with students who joined to this trip in order to see how actual being busy affect the perception about time. The interviews were conducted after this trip with 5 available students in order to understand how their time perception was affected by this busy week which required breaking their routines and experiencing new things every day.

The criteria while selecting the other 5 students was to feel time pressure in their daily life. This is detected by asking the questions indicated by time pressure scale proposed by Roxburgh (2004). The scale can be found in Appendix A. This scale aims to measure the subjective experience of people about the constraints of time. The interviews were conducted with people who had the score above the average. The aim was to understand how the feeling of time scarcity and time pressure affects their time experience in terms of experienced and remembered time duration and how they are coping with this feeling.

4.1.2. Method

Interviews intended to explore personal time experiences of the participants. Therefore, semi-structured and open-ended questions were preferred in terms of their facilitation of in-depth exploration. Although the interviews commenced with main determined questions, if other themes emerge during the conversation, additional

questions were asked to interpret that theme.

Questions differed for two participant groups which the participants are who join to 'Berlin Case Study Trip' and the ones who feels time shortage and time pressure in their daily lives. These questions are introduced below.

The questions asked to students who has time pressure in their daily lives were about their time experience and the strategies that they used to ease the feeling of time pressure and time scarcity. The questions of this group of participants are presented below.

> How time passes for you in daily life? (slow/fast)
>
>> When do you feel the time is passing slower for you?
>> When do you feel time is passing faster for you?

These questions aimed to see if the proposed theories about perceived duration of an objective time aligns with personal experiences of the participants who experience time pressure in their daily lives.

>> Do you have any strategies to cope with the feeling of time pressure or time shortage? Why do you use it/ How it helps you?

This question explores whether participants use the strategies recommended by the literature or if there are new methods used against the feeling of time scarcity or time pressure. This question is asked to both participant groups.

The questions which are asked to the participants, who participated the Berlin case study trip, were also based on their time experience during the trip and about the remembered duration of the trip.

>> How time passed time in a day during your Berlin trip (slow/fast)?

This question explores how they felt about experienced duration during the day. Since, it is crucial to see how their busy schedule affected their daily time experience.

> When you think about your Berlin week how do you feel about the duration of the week? Does it feel longer\shorter than a week?

This question aims to reveal how their busy schedule and new experiences affected the remembered duration of that week.

The interviews were recorded, and the qualitative data gained were examined with both deductive approach and inductive approach (Thomas, 2006). Deductive analysis focused on if the data gained through interviews about the pace of time and perceived duration is consisted with the studies in the literature or not. Inductive approach was used while analysing the answers about the strategies of the participants in order to allow the emerge of themes from raw data. The transcripts were examined. Firstly, the differences and similarities between the findings from literature and the time experience of people is compared. While evaluating the answers about the strategies, three themes raised which are the strategies used by the participants, the functions of them and the drawbacks of them. The results of this qualitative research are presented below.

4.1.3. Results of Exploratory Interviews

The qualitative data gained from the interviews were clustered separately for two group of participants. Firstly, the answers of students, who participated to the case study trip, clustered in 3 main categories. The first one is experienced duration that how they felt the duration of the day. The second one is remembered duration that when they look at their week, how they feel about the duration of the week. The third theme is the strategies used to cope with time pressure during that week or anytime. The findings from the first two categories are introduced in Section 4.1.3.1. The findings about the strategies are demonstrated in the Section 4.1.3.2

Secondly, the answers of other 5 participants, who feels time pressure and time scarcity in their lives, are clustered in three main themes. The first one is the situations that they feel time pace faster. The second one is the situations that they feel time pace faster. The third one is the coping strategies with the feeling of time pressure. The insights from first two categories are introduced in Section 4.1.3.1. and the third category is illustrated in Section 4.1.3.2.

4.1.3.1. The Pace of Time and Perceived Duration

These exploratory interviews conducted with two different participant groups show that the conditions or situations, which changes the perceived pace of time, aligns with the literature (Section 2.2.3.) and there are no any emerging themes related with the pace of time.

The interviews with the participants, who feel time pressure and time shortage in their lives, show that if the task is new or requires attention of the participant or if it is fun, the time feels faster than the experienced pace normally. This aligns with the knowledge proposed in the literature (Section 2.2.3). Since, when a person engaged with a task, which requires focus, the processed temporal clues decreases, and 'experienced' duration feels shorter (Section 2.2.3.)

Representative quotes about this theme from interviews:

> *'When I focus on something, time just flies!'*

> *'Last week, I went to Paris with my friends for three days. We did many things there; it was so much fun! Time passed so fast there, but when I think, I feel we spent almost a week there. It seems to me it was quite long.'*

In addition, they all indicated 'to get bored' as the situation which made them to feel the pace of time slower. This aligns with the knowledge proposed in the literature (Section 2.2.3.) and there were no any emerging themes about the factors that slows perceived time.

The findings from the interviews conducted with the students, who participated the case study trip, showed that the perceived time duration changes according to the new information and experiences. All participants stated that they felt time passed too fast every day (experienced duration). They all stated that when they thought about that week, they felt like they were there more than a week (remembered duration). Their indications about 'experienced' and 'remembered' duration were similar with the literature. As indicated in the literature (Section 2.2.3), the difference between objective time period and the perceived duration is a function of information processing. According to the knowledge gained from the literature, participants' busyness with new tasks and challenges every day can be shown as the reasons which makes them to feel 'experienced' duration shorter and 'remembered' duration longer.

4.1.3.2. Strategies to Cope with Time Pressure

The answers of two group of the participants in the category of the strategies to overcome the feeling of time shortage and time pressure evaluated together. This category was clustered again in three subtitles that are the strategies used by the participants, the functions of the strategies and the negative aspects or the drawbacks of these strategies.

4.1.3.2.1. The Strategies Used by The Participants

The answers showed that keeping diaries, calendars, planners, time tables, to do lists, mood diaries and doing meditation are the strategies used by these 10 participants to cope with the feeling time pressure and time shortage. There was no any outstanding strategy preferred by most of the participants. Each strategy was mentioned by 2 or 3 participants.

4.1.3.2.2. The Functions of The Strategies

The second part of the question, which is 'why do you use it' and 'how it helps you?', gave crucial insights about the expectations and needs of the participants to cope with the pressure of time and the feeling of time shortage. The answers given to this part of

the questions indicated three main functions of these strategies. These three functions are presented below.

The first function of preferred strategies is helping to plan the time. Planners, to do lists, calendars and time tables are in this group. It is indicated that to plan the time helps creating time for activities, such as, for hobbies or any other goals; thus, even if they are busy, they feel better about time when they manage their time. These tools are helping people what they want to do and who they want to be by helping to plan their time. In addition to that these tools are materializing the identity of the person and make them aware of their priorities and values. However, as stated in literature review Section 2.2.1., chronic time pressure is a complex problem which cannot be solved only by only time management tools. Because, although time allocation tools help to overcome the feeling of time shortage, it does not help the emotional experience of time starvation. Therefore, this finding was not used as a design direction in the idea generation phase.

The second function of the strategies is making aware of the things they experienced. As indicated by participants, diaries, planners, to do lists, calendars and time tables are the tools make them to realize what they had done during a certain period of time and the accomplished tasks give the feeling of satisfaction and fulfilment about their time usage rather than to feel that they are 'running out of time'. Thus, to see the things they achieved or experienced, change how they feel about time. This shows that to review a period of time such as a day, week or month, prevents the feeling of wasting their time and it helps them to cope with the illusory feeling of time shortage. This finding was used in design phase as a design direction later on (Section 6.1.).

The third function is increasing their awareness about their state and make them see the things objectively and relax. To do lists and doing meditation were stated in this group. Three participants indicated that they use meditation when they are stressed about things they need to do. They stated that it helps to be aware of their feelings and when they do meditation, they realize their exaggeration about the situation. One of

them stated that 'I am generally quite busy. Meditation helps me to relax. Because it helps me to stop and see what I feel at that moment. To be aware of the moment stops you to go with the flow of negative thoughts.' One of the participants mentioned about a similar function of to-do lists for her. She stated that 'I generally freak out, when I think the things I need to do, but when you do a list of things, I understand my stress is not. According to the findings gained from explorative interviews, paying attention to the moment helps to be aware of the emotions and the mood of the person, and this awareness is crucial as the first step as a strategy to cope with the self-deceptive feeling of time shortage and time pressure. Therefore, it is important to make them people aware of their emotional state or mood.

4.1.3.2.3. The Drawback of The Strategies

Although these strategies help people to cope with time pressure, participants also indicated some drawbacks which prevents participants to use them constantly.

Keeping diary as a strategy indicated by 4 of the participants. Although, it helps them to realize their activities experienced during the day and makes them feel better about their time usage, they all indicated that they do not write diary properly because of forgeting or not having time to write.

Mood diary is the one of the strategies mentioned by one of the participants during the interviews. These mood diaries can be found in many different forms in the market. People can use the templates designed before or they can draw their own. Figure 4.1. shows some of the samples of mood diary templates. Although the design of them can change, the aim of all kind of mood diaries is the same that is to help people to track their mood daily, weekly, monthly and even yearly by colouring the day with the colour which is associated with a certain mood before starting to use these diaries.
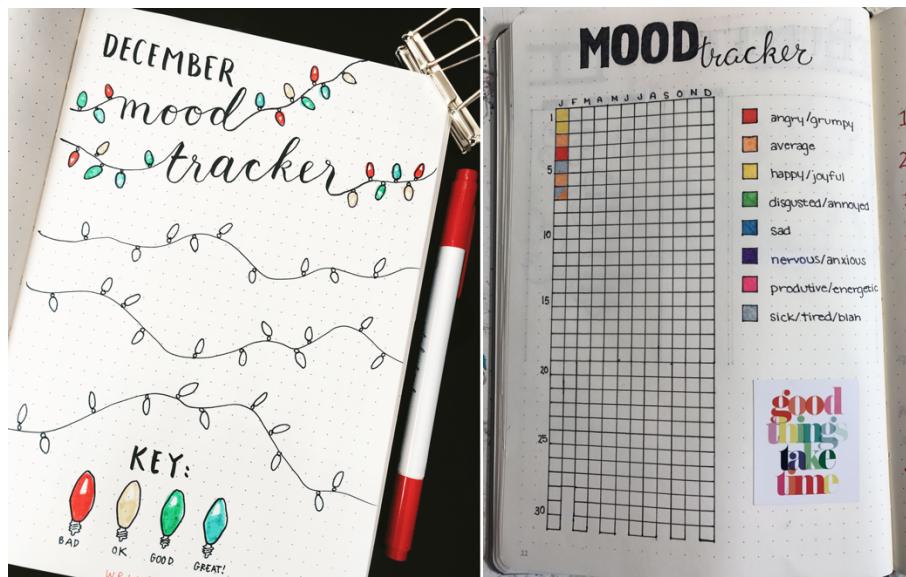
Figure 4.1. Mood diary template samples

Figure 4.2. shows one of the participants' monthly mood diary drawn by the participant. She indicated that before starting to keep this diary, she was feeling that every day is the same with each other and she is drifting with the time without doing anything. Therefore, she wanted to see how she is actually feeling every day. Because she thinks that to have an overview of her different moods everyday would give a feeling that she is experiencing different things while spending her time and every day is not the same. She indicated that she was excited and decisive to keep her mood diary regularly for a year. However, after a while, she realized from the colours that her mood is mostly the same at normal state, and this made her more stressful about her time usage than the previous state of her. It makes her to feel that she is spending days without doing anything different. Thus, she loses her interest to keep this mood diary and does not want to continue.

Figure 4.2. One participant's mood diary drawn by her

This negative experience of the participant shows that although these mood diaries can be seen similar with the regular diaries, the feedbacks' lack of details about the daily experiences, gives a perception that the participant experiencing same things everyday and this causes more pressure about the time on the user. Therefore, it is important to enable people to review details about their daily lives, such as; their activities and emotions.

4.1.4. Insights from Preliminary Studies

In conclusion, the strategies or tools are hard to embed in daily life and require discipline and time to learn or use them. This causes a dilemma that to recommend people, who suffer from time scarcity, to spend their limited time for these strategies to cope with time pressure. Even though people try to use these strategies after a while they naturally give up spending time for them and surround the feeling of time

pressure. Therefore, it is crucial to create an alternative to these strategies which is compatible with daily activities and does not demand extra time or effort.

4.2. Time and Design

Time is an intriguing subject also for design field. There are many different products and concept designs about time. To examine these designs is crucial to understand how the time experience and the perception about time can be changed by framing the concept of time differently. In addition, benchmarking of time related designs provides a perspective on what are the strategies used by the current products/ concepts and what is required in a product/concept which would help empowering people who suffers from time pressure.

4.2.1. Time Related Designs and Concepts

Benchmarking and the collection of current designs can serve as intermediary design knowledge, which is in between particular artifacts, such as; actual designs, and abstractions, such as; generalizations, theories (Höök et al, 2015) that helps to frame possible themes or design solutions (Stappers and Giaccardi, 2018). Therefore, many different time related designs from produced products through more conceptual ones are collected and clustered in order to reframe the possible themes and designs.

The designs are examined due to their similarities and differences. According to their proposed function, the products organized. The range starts from the products and concepts which aims to show time by their different interpretations and goes through the ones which does not intend to show time but still representing time. In addition to this range, they also clustered according to their function to slowing time through strategies or their representation of slowness.

Some of the designs are shown in the figure 4.3. The designs, which keeps the function of showing the time are positioned starting from left. Towards the right side, the designs, which does not intend to show the time but functions by representing the concept of time. In addition to the change on their function, their designs of the form
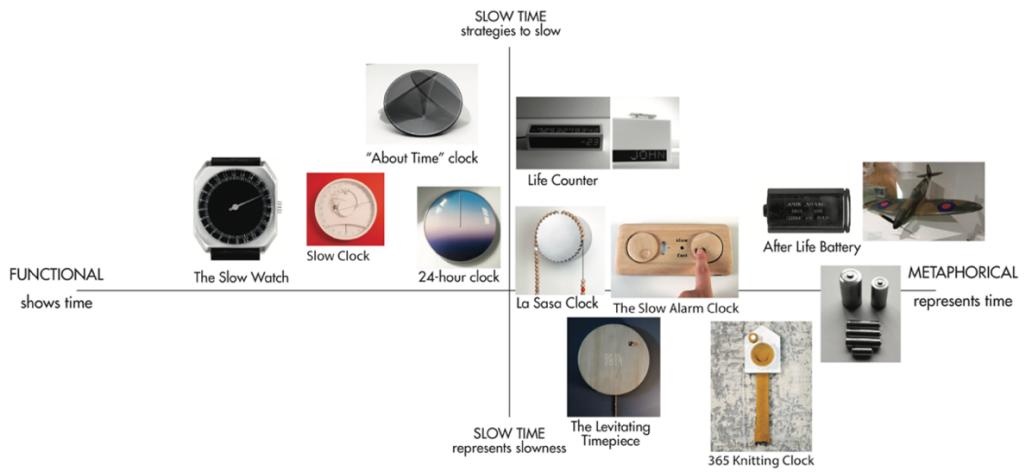
Figure 4.3. The clustered designs which framing the concept of time

At first glance, 'the Slow Watch' shown in figure 4.4. looks as traditional wrist watches. However, it is a watch designed to change the way of reading time by not showing 24 hours rather than 12 hours. Thus, the pointer of the clock moves slower than regular watches' and it allows to see one's entire day. The aim of this design to make the user focus on the moment rather than seconds or minutes.

Figure 4.4. Slow Watch

Figure 4.5. After life Battery

The project of James Auger and Jimmy Loizeau, 'Afterlife Battery' (figure 4.5.) is considerably different than 'the Slow Watch' in terms of its way of addressing the time concept. This concept includes turning the human body into chemical energy after death. After accumulating the chemical energy from deceased body, the energy is stored in batteries with the name of the body's owner. These batteries can be used for any purposes by the family members. This conceptual project arouses a question of what should be done with your 'After Life Batteries' or your loved ones' batteries. This question encourages people to think about the concept of time.

Figure 4.6. Life counter by Ippei (2001)

The 'Life counter' indicated in figure 4.6. is another discussion evocatory design about time. The product, which looks like a digital clock, requires to enter remained estimated life time of the user for activation. Afterwards, display starts to countdown the user's remained time. During this count down the user can see how many years, days, hours and even the seconds left on the display of the product. This product has been discussed by Dunne and Raby (2001) in terms of critical design and the experience aroused by the emotions generated by the product (Fokkinga and Desmet, 2012). While using this product, although, the user may choose to focus on the amount of time they have and may feel relaxed, to comprehend every second as a loss from their lifetime provokes emotions like anxiety and horror (Fokkinga and Desmet, 2012).

This design elucidates how the perception about time can be manipulated by the way of framing the 'time concept'. This product represents time concept as something be 'spent or lost' and this creates a negative experience and perception about time. Although this product is seen as a speculative design item, to show time with the things consumed or consume is a familiar concept from early time pieces as mentioned in 'History of Time Keeping Section'. The principle of water clocks that to measure time by the things consumed or consume inspired other time measuring tools such as sand clocks and water clocks as shown in figure 4.7. The concept of showing time with the things be 'spent or lost' is used since ancient times. Although these tools are not used to measure time in daily life nowadays, the sand clocks are still used as the representation of time.
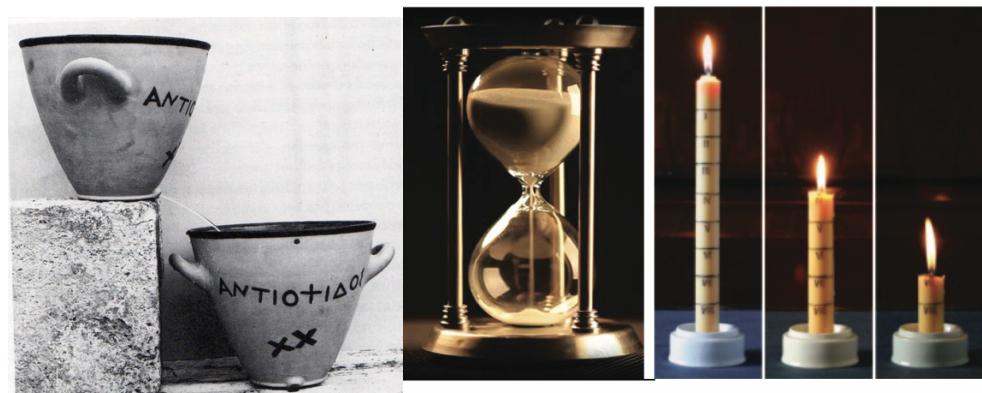
Figure 4.7. Examples from early time pieces (water clock, sand clock, candle clock)

If showing people what they lose enhance this negative perception, what if a product represents time as what it gains to people. This question inspired the design process.

CHAPTER 5

DESIGN PHASE

Before commencing design process, directions are determined according to the knowledge iteratively gained through the literature research and explorative studies in order to design for. These directions were the findings that proposed to make time feel slower or they were the strategies which helps to cope with the feeling of time pressure. Therefore, these directions worked as the criteria in ideation phase in two ways. Firstly, these directions lead idea generation to generate concepts and, secondly, they functioned while evaluating them. Later in the design phase, these directions are transformed into objectives which are needed to be reflected by the concepts. New concepts are designed according to these objectives. The final concept had been chosen due to the level of fulfilling these objectives and the prototype of the final concept is produced in order to test it with actual user as the last phase of the study. This chapter introduces the design process of this final concept and the phase of producing the prototype of this design.

5.1. Initial Idea Generation

Before starting initial idea generation phase, the insights enhanced from literature review and preliminary studies are converted into directions which lead the design process by setting a purpose to fulfil. These directions were the findings, which were acquired from literature and preliminary studies, in order to make time feel slower or the recommendations to cope with chronic time pressure. In addition, the insights gained from preliminary studies are taken as design directions.

As demonstrated in the figure 5.1. design directions are placed as a matrix and generated concepts were placed on this matrix according to their level of functioning and communicating the directions. The red dots on the figure 5.1. shows the generated

concepts with red dots and they are placed according to their focused function. To illustrate if the concept functions two of the directions at the same level it is positioned in between that two directions. However, if there is a prioritized direction, it is indicated by placing the concept closer to the prioritized direction.

Design Directions

| experienced duration | | remembered duration |
| elongate the moment | | elongated in memory |

be aware of
the moment
- experience here and now
- focus on the moment
concept 1
concept 2

break
the routines
concept 5

design for
slowness,
solitude, and
mental rest
concept 6

concept 7

get bored
concept 3

be aware
of time
allocation
concept 4

encourage for
new experiences

Figure 5.1. The design directions. Distributions of the concepts

The aim of using this matrix was to compare the concepts in terms of their functions. The directions were clustered in two main categories according to their functions that are elongating 'experienced duration' and elongating the 'remembered duration'. Since, it is possible to manipulate the perceived duration in two ways, which are in the moment and in the memory as stated in the literature (Section 2.2.3). The directions were the ways to function these two main categories. In addition to these directions, there were also two directions which were not serve these two main categories. These two other directions were created from the insights from the preliminary studies and the inspirations from the slowness movements mentioned in the literature review section. They were creating awareness about time allocation and encouraging for

slowness. These two were positioned in the middle on the matrix because of not functioning the two main categories mentioned above. These design directions are given below:

- 1st category of directions: Elongating experienced duration in the moment
  - Focusing on the moment (experience here and now)
  - Breaking routines
  - Creating boredom (get bored)
- 2nd category of directions: Elongating remembered duration in the memory
  - Encouraging to new experiences/ learning new things
  - Breaking routines
- Other direction:
  Rising awareness about time allocation or subjective time

Figure 5.2 illustrates the concept 4. This concept is positioned in the middle of the matrix, since it aims to create an awareness on time allocation. The emotions of the user are recorded through an emotion tracker and also intendedly. If user wants to record an emotion in any moment, she can record it through different expressions. This feature recording the emotions by the user is proposed to motivate people to observe themselves, their emotions and be aware of the moment. Thus, this concept would function the 1st category. In addition, the recorded emotions via emotion tracker and the user would be displayed on a digital screen which is located in the house of the user in order to make the user review the day. These emotions would be accumulated every day and the user could review also the weeks or the differences of the days in terms of the emotions the experienced. Thus, the user would realize the diversity in the emotions even if they do the same activities. To make people review their days and weeks would serve for the 2nd category as explained in chapters 3. This concept is designed to function two categories equally during the usage phase.

Therefore, in the matrix this concept is located in between the categories. As explained for this concept, also the other concepts are located on the matrix in terms of their function.
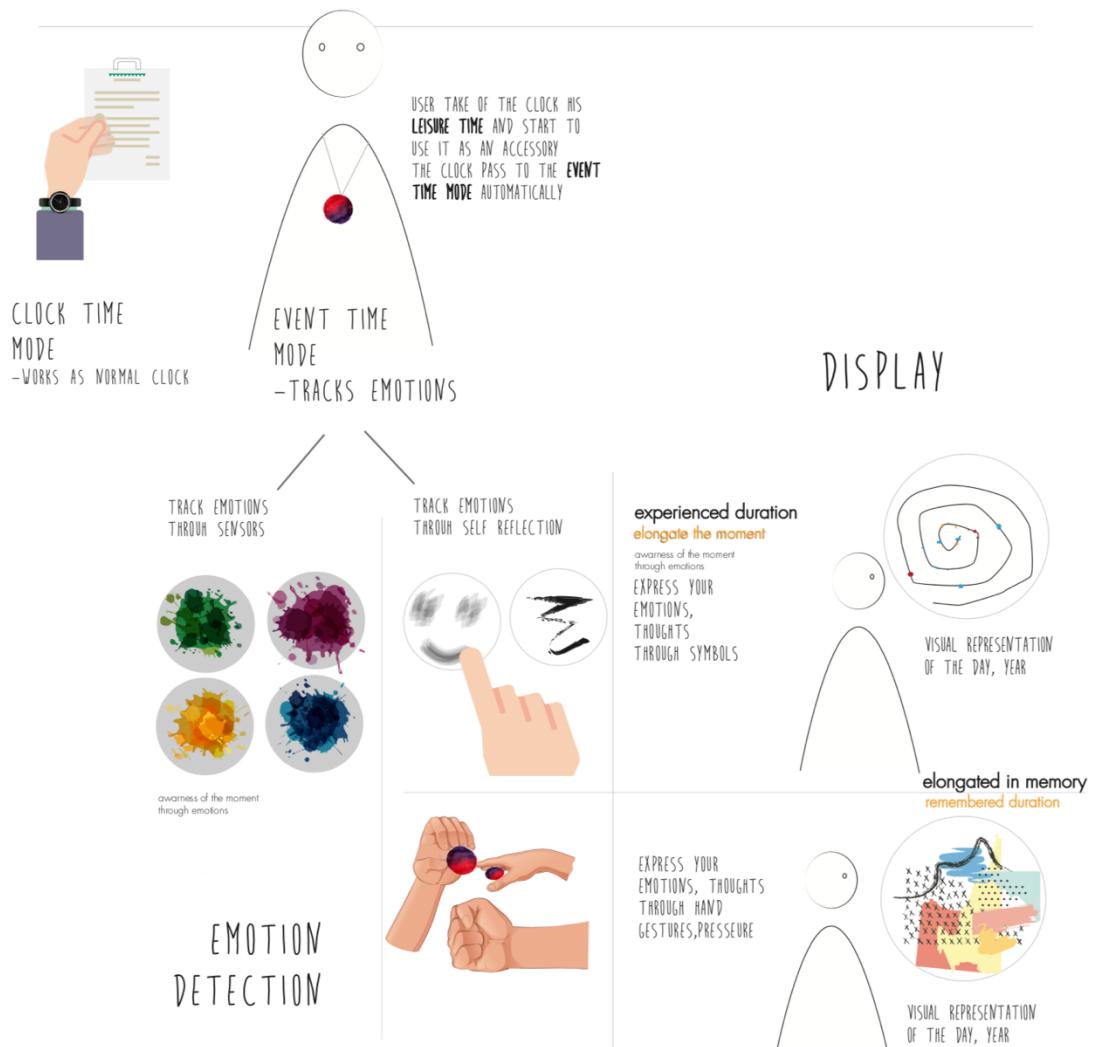
Figure 5.2. Concept 4 - The usage scenario

After generating ideas according to the design directions, concepts are evaluated in a session with four specialists from positive design field. Before introducing the ideas, the insights from literature review and preliminary studies presented in order to make the participants in the session familiar with the chronic time pressure context. Thus, the level of importance of the design directions to communicate by the designs in order to create a product which could help to cope with chronic time pressure is also assessed during the session. This helped to decide final objectives for the next concept generation session.

The criteria while evaluating concepts are;

- Does the concept communicate the design directions?
- What is the level of adaptation of the strategies? Does it function the strategies?

The ideas introduced the participants through sketches and storyboards showing the usage scenarios. After presenting the ideas evaluation part started. The concepts are evaluated according to the criteria above. Afterwards, design objectives were identified in the session in order to increase the level of satisfying the strategies and insights gained from research activities through the concepts. These objectives were determined as the requirements which are needed to be function by the concepts.

5.2. Design Objectives and Second Concept Generation Phase

In this section, the design objectives and the selected final design concept will be introduced. Four objectives are identified as the requirements for a product which could help people, who suffer from chronic time pressure, to cope with the feeling of chronic time pressure.

5.2.1. 1st Objective – To make people to pay attention to the moment/ be aware of their emotions/ moods

As mentioned in literature section, focusing on the moment elongates experienced

time duration because of increasing the amount of information processed by the brain at that moment. In addition, according to the findings gained from explorative interviews, paying attention to the moment also helps to be aware of the emotions and the mood of the person, and this awareness is crucial as the first step as a strategy to cope with the self-deceptive feeling of time shortage and time pressure. Therefore, a product, which aims to empower people to cope with the feeling of time pressure, should make people pay attention to the moment. This was the first objective which guides second concept generation phase.

5.2.2. 2nd Objective – To make people to review their day/ week

The second objective was to make people review their day, week, month and year. The findings from exploratory interviews indicated that people prefer to keep diaries, time tables, mood diaries. Because, reviewing their day, week. month, year make them realize their activities and experiences and it helps to ease the self-deceptive feeling of time pressure by changing their idea that they consume time by doing nothing. Therefore, it is important to include an aspect to the concept that helps to review the one's time.

5.2.3. 3rd Objective – To make them experience new things

The third objective was to encourage people to experience new things. Since, the processing of a new information by the brain takes more energy and time for the brain and this results to perceive remembered duration longer than the objective period of time.

5.2.4. 4th Objective - Attributing Meaning to The Accessory

During evaluation session of the initial ideas, it is indicated that although these concepts are communicating the strategies and insights enhanced from the literature, the way of representing time is also crucial as indicated in Section 5.1. In the time and design chapter, it is demonstrated that the way of framing and representing time, can affect the experience of time. If time is represented as something people lose and run

out every second, it creates a negative experience. This raised the question what if time is associated with something opposite of consumed in order to change this negative perception about time and this gave the inspiration to associate time with what people gain and what they accumulate through it. This inspired the fourth objective, which is to frame time as people gain not lose every moment. The fourth objective is determined as to facilitate positive associations about time.

However, this objective was still abstract to be used in concept generation phase. In order to transform it to more defined aspect, it is explored that how time can be seen as accumulation, what it accumulates. Nature became an inspiration for the answer of these questions. As shown in the figure 5.2. the tangible traces of time can be seen in the nature. To illustrate, the age circles of trees. These age circles do not only show the objective time that they had, but also, they give clues about the conditions which causes to that the tree experienced during that period of time (Sexton, 1959). This can be seen as the accumulation of the factors which affects to the tree through time as a tangible representation of the conditions of the tree. Therefore, these age circles can be seen as tangible time that became the identity of trees which is comprised by the experienced conditions. This analogy inspired that the identity of a person is also transformed by the experiences enhanced through time. Thus, time adds people every moment by experiences and it helps them to become better version of themselves. To reflect this view through the design is taken as the main challenge and aim of the next concept generation phase. The concept generation phase started with the question 'Is it possible to design a product which represents the transformation of a person through time?'. The next question was 'how transformation can be represented?'.

Figure 5.3. Mood Board for Concept Generation

The aim was to design a product which changes through time depending on the experiences of the user in order to represent the transformation and the growth of the user through time. The concept also would include the other three objectives mentioned before.

New three concepts are designed with the aim of functioning the objectives. These concepts again evaluated in terms of how they would be successful to communicate these objectives. One final concept is selected to produce the prototype of it because of it's potential to function the objectives.

5.3. Final Concept

In this section the final concept is represented. This final concept is a product proposal which is designed by the guidance of defined objectives and it is proposed to empower people who suffer from chronic feeling of time pressure and time scarcity by functioning these objectives. The aim to design this concept to provide a sample in order to test how these objectives can be adapted to a product. Since, this concept is tested in terms of how the aspects of the concept help or prevent the functioning of objectives in order to inspire designers about the ways to adapt these objectives to product concepts.

As mentioned in fourth objective (Section 5.2.), the way of framing time is crucial in terms of which kind of perception and experience would be created through the product. Therefore, as indicated in Section 6.2.4. in order to show people that time passing is rewarding, the concept aimed to associate time with what people gain through time passing.

It is decided to emphasize the transformation of people through the product in order to emphasize what people gain through time passing and in order to show the transformation of the person, the experiences and emotions are determined as the indicators of this transformation. Since, time accumulates the experiences of people and these experiences creates emotions according to the appraisal of the person about these experiences and this transform and make people who they are. Therefore, their identity can be seen as what people gain through time.

The concept an accessory which changes/transforms according to the experiences and emotions. The person would have a chance to how he or she transforms through time. It is proposed that to be able to observe one's transformation would change the illusory feeling of people consuming time by doing and gaining anything. the important thing was to design something which would be carried by the person be for 24 hours and would be transformed according to the experiences and emotions. Therefore, to provide a flexibility to carry this accessory was crucial. As shown in the figure 5.3. the accessory would give opportunity to be used in different styles according to the preference of the user. These pieces are named as 'Time pieces' in the concept. Each time piece would represent a certain period of time and they would be used for this period of time in order to show how they transformed differently in the same amount of time.

Attachable or can be sticked on different parts of the body

Figure 5.4. The usage of 'Time Piece'

As indicated in figure 5.4. the user would have identical 'Time Pieces'. After starting to use the pieces, it would start to be transformed with the person.
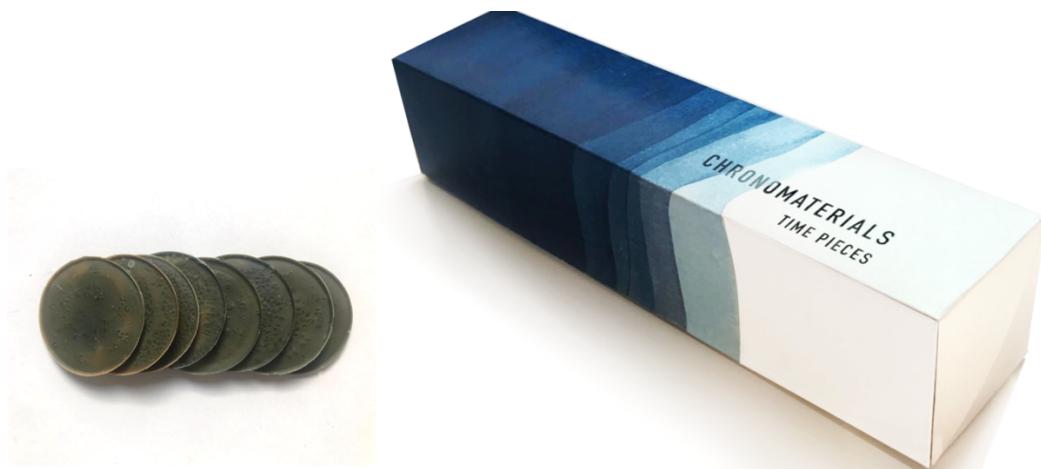
Figure 5.5. How people receive the 'Time Pieces'

When the 'Time Piece' removed, the changes on the pieces would stop and the person could have a chance to store and collect the transformed pieces as shown in the figure 5.5.
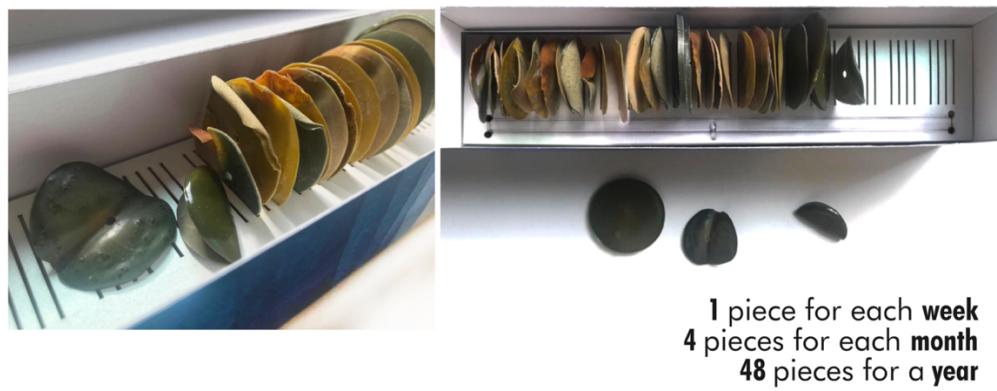
Figure 5.6. The representation of the collection of the pieces

The aim was to represent objective period of time with each piece and to illustrate the subjective time usage with the pieces changed differently. The irreversible changes on the material would make people to wonder the reasons of these traces and the person would naturally start reviewing his/her activities and experiences to find out the effects caused these changes. Thus, the person would realize how he/she experienced different experience and emotions as shown in the same period of time the figure 5.6.

Figure 5.7. The changes on the pieces makes the user review the time period that they used the 'time piece'

STORE THEM

before usage

pieces are identical

changing process has not started yet

user should observe the pieces are identical

CARRY ON BODY

during usage

pieces changes through

bodily and environmental changes

user should be able to observe the changes

STORE THEM

after usage

changing process stops when they remove the piece

user should be able to observe the differences between the pieces and review their day/week/

Figure 5.8. The functions of the piece through usage phases

5.4. Production of Prototype

Materials have an active role in forming our experiences with artefacts through their properties (Manzini, 1986; Ashby and Johnson, 2009; Karana, 2009; Rognoli and Levi, 2004; Karana, Pedgley and Rognoli, 2014). In this concept, it is proposed that the material can facilitate a positive experience which creates a positive meaning and metaphor about time by representing the transformation of the person. Traces on a material occurring through time record experiences and behaviors (O'Connor, 2006; Rosner and Taylor, 2013) and ultimately mediate qualities inscribing a story (Rognoli and Karana, 2014). Therefore, traces can be exploited to manifest the transformation of one's tangibly. Utilizing traces as the marks of emotions and experiences in order to make the personal growth and transformation of a person through time legible was the aim of the concept. Thus, it is determined to design a material which would make emotions and experiences legible through traces.

Although, this concept could be designed with smart materials, it is determined to use bio materials. Since, a bio-material which has a nature to transform through time like a human being would create also a metaphorical meaning that could help to associate it with the one's own transformation through time as indicated in 4th objective.

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After designing this concept, the challenge was how one's emotions and activities can be reflected and cause changes on a material. Therefore, firstly it is investigated that what are the indications of emotions and activities. It is found that the bodily changes, such as sweat, body temperature, pH level, can be used to detect different emotions. In addition, environmental changes such as, the humidity, temperature, pH can also give clues about the activities of the person. To illustrate, if a person swim, the pH level of the water can be used as an indicator of that activity.

It is determined to develop a material which would keep the changes made by the bodily and environmental changes as the traces of the emotions and the experiences of a person on the material. The material is developed with the collaboration of Material Experience Lab in the Netherlands (http://materialsexperiencelab.com) for six months. This process is conducted by the advisory of Assoc. Prof. Elvin Karana. In addition, the collaboration of Prof. Dr. Stephen Picken from the department Applied Science in TU Delft assisted the material development process.
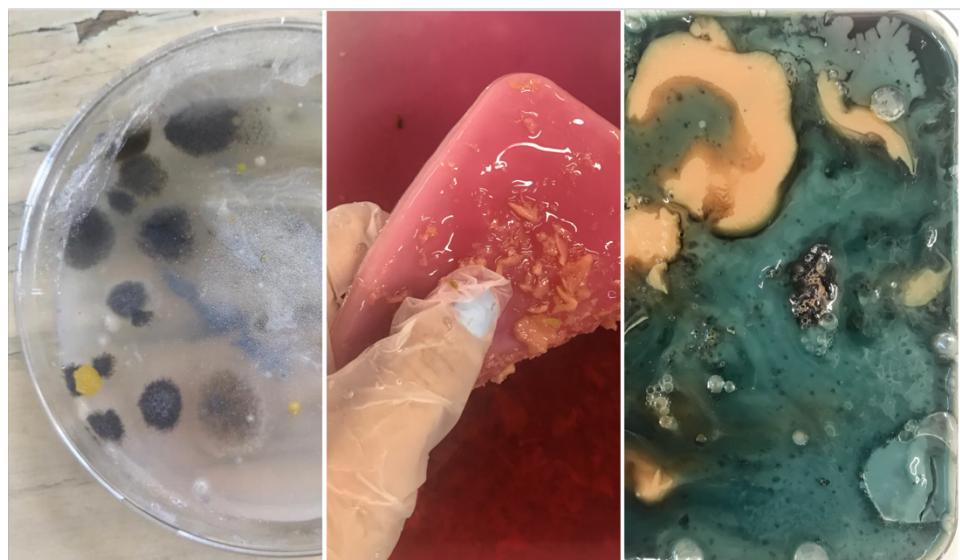
Figure 5.9. Pictures from material tinkering process.

(cultivated hand bacteria, bacterial cellulose, mussel shell material)
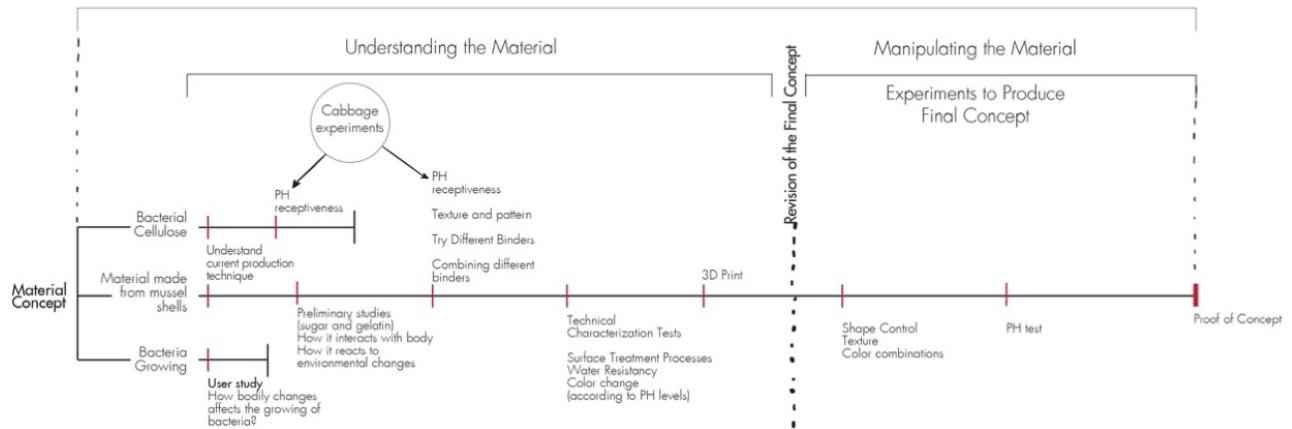
Figure 5.10. The phases of material design

As indicated in the figure 5.9. material design process started with three different material idea. After some experiments one material, which is made with sea shells, is decided to continue with in terms of giving more room for manipulations. The figure 5.10. shows the process and phases of material design.
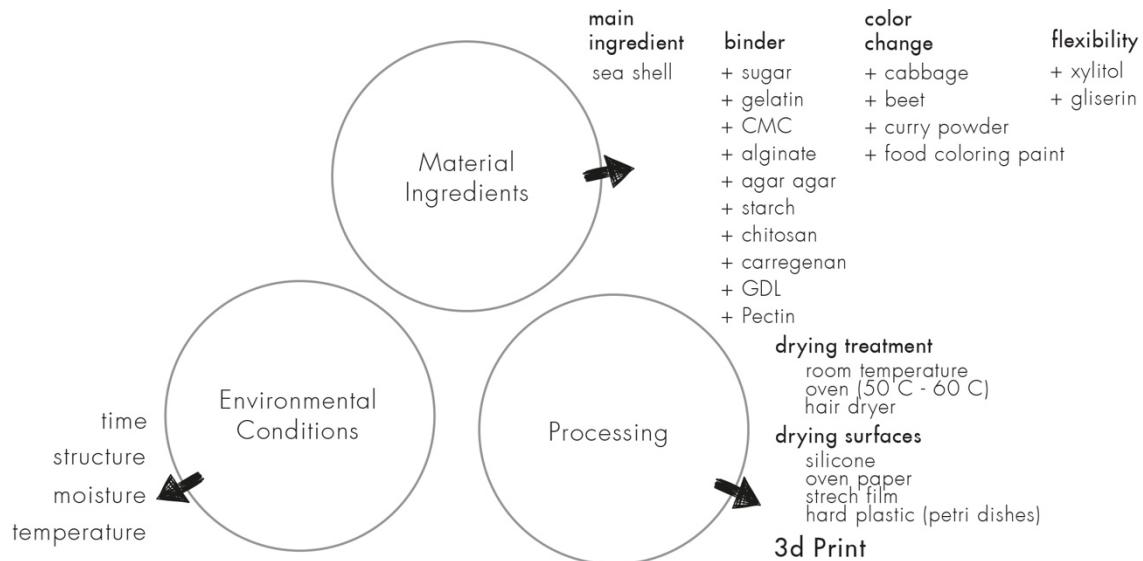
Figure 5.11. Material Taxonomy, which shows the variables used during the material development process

The first stage of material design process focused on understanding the capabilities of designed material and how it can differ by using different variables. Figure 5.11.

shows the variables used during material design process. By changing these variables different qualities; such as color, texture, flexibility, are enhanced as shown in figure 5.12.
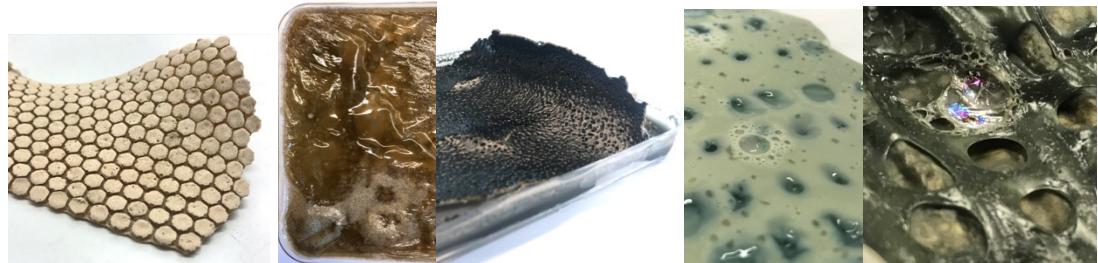
Figure 5.12. (From left to right) The pattern achieved by mold, color and texture change owing to drying treatment in different temperatures (50C, 60 C), perforated surface provided by cabbage water drops.

The designed material is tested with the user several times to observe if the traces of the bodily changes and environmental changes are readable and give the clues about the activities.
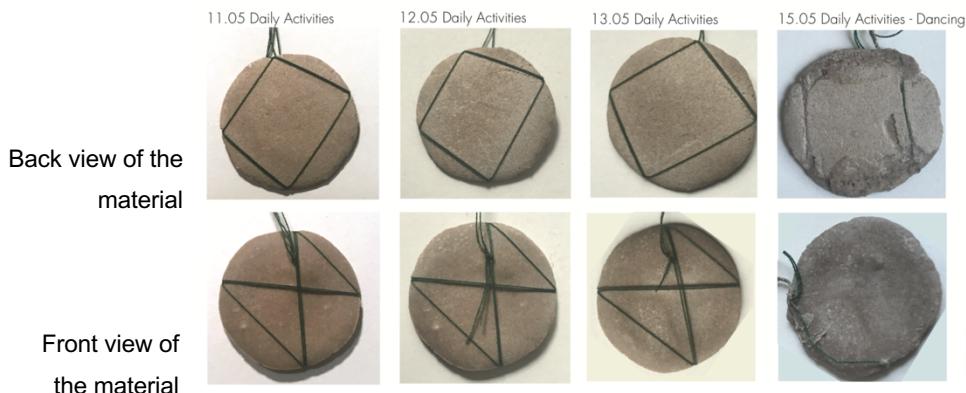
Figure 5.13. The tested piece for four days

The figure 5.10. demonstrates one of tested material piece by a user. This time piece is wore by a person for four days. The user noted her activities during these four days. On the fourth day, she went for a dancing class and this difference on her daily activities was observable on the material because of the effect of the sweat.

Figure 5.14. Some examples from 3d printed cylinders

After proving the material reacting body temperature and sweat, further experiments are conducted to improve this quality of the material and also to understand the material further. Technical characterization tests were conducted. Surface treatment (sanding), cutting, water resistancy and color change through the PH levels of the material made by gelatine have tested. Figure 5.14. shows some of the examples from 3d printing experiments with the material.

Initial prototype of the concept is exhibited in 'International Festival of Technology 2018' in Delft, The Netherlands. The figure 5.15. demonstrates the exhibited concept in the festival. The concept is introduced to the visitors via short descriptive speech. There was also a small poster which demonstrates how the material changes through

time and what is the idea behind the concept. Thus, the prototype is used to have insights of the visitors about the concept (Section 3.1.1.2). Only if there is any comments or questions about the concept is noted. Data is not collected systematically. The conversations with the visitor gave an overview of the reactions of the people about the idea behind the concept. There were no any negative comments about the concept and visitors who commented indicated they would like to use this kind of accessory which would transform through time by environmental and their bodily changes.

Figure 5.15. Delft International Festival of Technology 2018

Figure 5.16. Samples produced in manipulating phase

The second stage of the material design process focused on manipulating the material. In this stage, it is learned to manipulate the form, color, texture of the material as intended. After the final form of the material is determined for the concept, the material is tested with the user again in order to prove the material concept. Figure 5.17. one of the user tests with the material done to observe how the material would react bodily and environmental changes. These experiments with the material proved that the material changes as intended in the beginning of material design process.
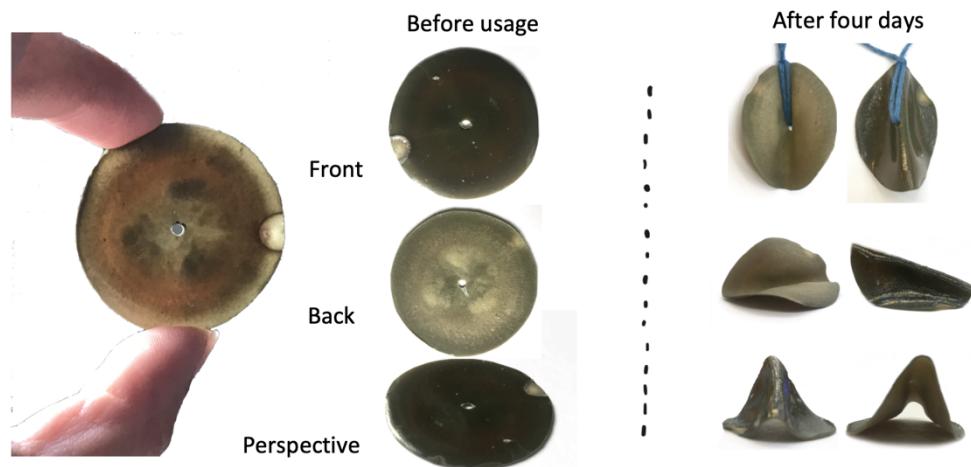
Figure 5.17. One of the samples from user tests with the material

After proving the concept final material pieces are prepared to use in evaluation study by 10 participants.

CHAPTER 6

EVALUATION STUDY

This chapter introduces the evaluation study which is the final step of the study. In previous chapters, the context of chronic time pressure is introduced by presenting the reasons, results and components of it. In addition, the strategies to cope with the feeling of time scarcity and time pressure examined through literature review and exploratory studies. Moreover, time related concepts and designs are reviewed to understand if they offer strategies to cope with this phenomenon and what are the possible solutions or themes to create a product which could help people, who suffers from this phenomenon. The insights from this iterative information generation process guided the design phase. After initial idea generation phase, a product proposition is generated by defining objectives. These objectives are determined as the features which needs to be met by a product which would empower people, who suffer from the experience of chronic time pressure. After concept generation phase, one final concept is selected in terms of its level of adaptation of these objectives compare to the other concepts. The prototype of this final concept is produced and used in an evaluation study to generate knowledge.

This chapter introduces the evaluation study which is the final step of the study. The aim of the study, the procedure of the study and the findings are presented below.

6.1. Evaluation Study

As introduced in previous chapters, one final concept is developed as a product proposition which would empower people, who suffer from the experience of chronic time pressure, to cope with this phenomenon. As indicated in the Section 3.1.2., prototypes can be used to generate knowledge during 'Research through Design' process. This final concept, which is a result of an iterative knowledge generation

process, is also used in an evaluation study in order to generate knowledge to answer the final research question. Therefore, the aim of the evaluation study was to discern how this product proposition functions and if this proposition is viable to make the objectives work. The findings gained from the study provided knowledge to answer the final research question which is 'how the strategies helping to overcome time pressure and the strategies recommended to elongate time perception can be adapted to a product?' The following sections introduces this evaluation study in detail and presents the study findings.

6.1.1. Tested Elements of The Concept

The final prototype, which consists of three components as shown in the figure 6.1., used in the evaluation study. The first component of the prototype is the designed material which changes according to the bodily and environmental changes as mentioned in Section 5.4. The second component of the prototype is the tie which enables participants to wear the material as a necklace. The third component of the prototype is the introductory brief which introduces the idea behind the concept, the aspects of the material and how the prototype should be used. In addition to these three elements of the design, the duration of the study was also an element of the concept which is expected to function one of the objectives that to make participants to review their time. The procedure for each element of the prototype is presented below.

Figure 6.1. The elements of the Concept (Two 'time piece' with their storage boxes, one tie used to wear the material, the introductory brief)

6.1.1.1. The Function of The Developed Material

The designed material is the main component of the study. It has two proposed functions in the study. Firstly, it aims to make people review their day and week. Since, exploratory interviews revealed that reviewing time usage is helpful to ease the illusory feeling of time pressure by making people to realize their experiences (Section 4.1.3.2.1.). Hence, making people to review their time allocation is a crucial objective which is needed to be functioned by the product and this material is used to function this objective of the concept.

The materials were produced before the study. Although all materials were made from the same mixture, the nature of the material do not allow to create hundred percent identical pieces. However, the crucial thing was that each participant should use two almost identical pieces in terms of the distribution of the ingredients, colour, texture and thickness and they should think that these two pieces are identical. Therefore, materials used in the study were selected according to this criteria. The aim of giving two same pieces to the participants was to make participants to observe how two same

material change differently each week. Since, the concept proposed that to observe the differences between two pieces which are used for the same amount of time, would make participants to think about the reasons of the changes and this means that they would need to review their week.

The second proposed effect of the material is to make people to pay attention to the moment and making them aware of their emotions, mood. Because, to be aware of the moment elongates the remembered and experienced duration as stated in the Section 2.2.3. Moreover, to pay attention to the moment leads to an awareness about one's mood and emotions and this is important to cope with the illusory feeling of time starvation and time pressure. Therefore, a product, which proposes to empower people suffering from chronic time pressure, should make people to be aware of the moment. The concept proposed that to realize the momentarily changes on the material, would make people to think about the reasons of this changes and they would pay attention to the changes on their body or in the environment. Thus, they would start to be more aware of the moment and their emotions causing their bodily changes because of the material.

6.1.1.2. The Function of The Tie

The tie is the second element which attributes the function of an accessory to the material pieces. This element is important in terms of its effect on the appearance of the accessory, enabling to carry the material 24 hours for two weeks as the closest thing to the body and facilitating the interaction between the material and the skin. Therefore, it is necessary that the participant should feel comfortable with the tie. Hence, some style, material and colour options were given to the participants, such as; metal chains looking more luxury, coloured ropes looking more natural or transparent rope which hardly can be seen.

Figure 6.2. Two different ties of two participants

6.1.1.3. The Function of The Introductory Brief

The third element of the concept is the introductory brief. The idea behind the concept, how the material works and how they should use the prototype is explained very briefly on the leaflet. In addition to explain how the concept works through this explanatory card, the main purpose of this leaflet is to emphasize the idea behind the concept. Since, the idea behind the concept is the key drive of the concept which is proposed to condition the participants to see the accessory as a reflection of their transformation (Section 5.3.). Therefore, it is emphasized on the brief that the material would change through the experiences of the participants as a reflection of their transformation through their experiences. To clarify how their experiences would cause the changes on the material, how the material works was explained.

6.1.1.4. The Function of The Duration of The Study

The duration of using one 'Time Piece' is one of the elements of the concept. The routines or rituals of a person can change day to day in a week according to one's work or leisure time. However, one week is a time period that ones' routines and rituals

would be repeated because of the mandatory actions, such as; going work, school in weekdays. Therefore, week is chosen in the idea generation phase (Section 5.3.) as the smallest time period which would contain the same routines and practices such as, weekday and weekend routines. The aim was to show people that even if they practice the same routines and rituals, every day is unique in terms of how they feel. Hence, the evaluation study is conducted for two weeks to see the effect of showing people that even if they feel they practice the same things every week, they feel differently every day through the material which changes by their bodily changes caused by their emotions.

6.1.2. Sampling

The study conducted with 10 participants for two weeks. 1 participant is a bachelor student, 5 participants are graduate students, 3 participants are PhD candidates and 1 participant is Associate Professor in Delft University of Technology (TU Delft). The answers of these participants are indicated with Time pressure scale proposed by Roxburgh (2004) is used while selecting the participants. Since, it is important to evaluate the concept in terms of its function for the people who feels the time pressure and time shortage in their daily lives constantly.

This scale draws upon the exploratory analysis of Dapkus (1985) about the experience of time and some sources about the tempo of time (Robinson, 1990; Wheaton,1985; Schriber and Gutek, 1987; Landy, Rastegary, Thayer, Colvin, 1991). The aim of the scale is to measure the subjective experience about time constraints and time pressure of a person through 9 questions related with personal experience about time (Roxburgh, 2004). The scale can be found in Appendix A.

Figure 6.3. Participants with their 'Time Pieces'

The participants assigned a consent from before doing this time scale. After approving the consent form, they answered 9 questions with 4 point Likert Scale (1-4 'strongly disagree' to 'strongly agree'). 10 participants who had a score below the average are selected for the study.

6.1.3. Procedure of The Study

The evaluation study is conducted for two weeks with 10 participants. Before starting to the study participants signed a consent form and they firstly answered the 'Time Pressure Scale' mentioned in Section 6.1.2. According to their score, they were selected to the study.

Two 'Time Pieces' with their storage boxes and one introductory brief were given to the participants. As demonstrated in the figure 6.2. participants selected their tie between some options as indicated in Section 6.1.1.2. One of the participants did not want to use any of the options, since she indicated that the style of given options does not fit her daily outfits. Therefore, a new tie was made for her according to her preferences. Another participant wanted to have three ties with different colours rather

than having only one for the case if he would like to change the colour of the tie during that two weeks. After these three elements were given to the participants, it had requested them to read the brief. After they read it, the idea behind the concept, how the material works and how they should use the prototype were explained very briefly as on the leaflet. It is emphasized that each material piece should be used for a week. At the end of the week, the piece needs to be changed with the unused one. During the usage phase, the material always needs to touch their skin. Only while taking shower they should take off the material during that period. After briefing the participants about the usage, they were also informed about the interviews which would be conducted at the end of the two weeks. This procedure was conducted individually with 5 of the participants. Although the concept was introduced separately, 5 of the participants had their prototypes at the same time and this caused a social interaction effect which was not considered during the concept generation and the planning of the study. This effect is presented in the Section 6.1.5.2.4.

When the usage phase had started, the time to change the material was not reminded to the participants except the briefing session in the beginning of the study. Because, it was also important to see if participants would have any difficulties to remember the time to change the material or not. To collect data during the usage phase was not preferred to do not disturb and interfere the experience created by the prototype. Therefore, the data was collected only by the semi-structured interviews conducted with the participants individually after the usage phase of the materials.

At the end of second week, appointments were arranged with the participants for the interviews. Semi structured interviews were conducted with 8 participants in that week. They brought the two pieces that they used for two weeks to the meeting. Interviews with other 2 participants are conducted at the end of that month after the usage phase because of their schedules. However, this delay gave other insights about the concept indicated in the Section 6.1.5.1.2.

To enhance in depth data about the experience of the participants, it was crucial to do

not conditioning, restricting or directing the participants with the themes assigned to the questions. Therefore, the interviews were commenced by asking participants to mention about their experience related with 'the accessory' for two weeks to make them comment about any facet of their experience in order to facilitate the emerge of new themes through the answers of the participants. The first question is indicated below.

'Would you like to mention about your experience with this accessory for two weeks?'

After participants expressed their thoughts and insights in any direction about these two weeks, the prepared open-ended questions were started to be asked. The questions are presented below.

(Make them focus on the moment, make them review the day/week)

Could you observe the changes on the material? When it changed? Were the changes momentarily noticeable?

How observing the changes on the material affected you?

Did your daily practices were affected by it? How?

(Encourage them to have new experiences)

Have you done/try something different from your daily routine in order to observe the effect of it to the material?

(Make them review the day/week)

When you look at the pieces does it reminds you something related with that weeks?

Is there any difference between the two pieces that you used? (Did two pieces change differently?)

What made them change differently? Do you remember any specific moment, reason or effect?

(Represent their transformation)

When you look at these two pieces, how do you feel/what do you think about these pieces?

Do they have a meaning for you? Why/ Why not?

Would you like to keep them? Why/ Why not?

According to the answers of the participant, if there was a new theme mentioned by the participant or an unclarity about the topic, additional questions were asked in order to understand the answer of the participant more in depth.

The reason to use semi-structured interviewing method was to facilitate the emerge of new themes in addition to the data about certain topics. Moreover, open-ended questions provide the opportunity to examine a topic more in depth (Tashakkori, Teddlie and B. Teddlie, 2003).

The interviews were recorded via voice recorder. In addition, during each interview, field notes were also taken about the themes mentioned by the participants. These notes are used in data analysing phase as a guidance to cluster the answers.

6.1.4. Data Analysis

In this section, the qualitative data analysis procedure is presented. The data analysis commenced with the transcription of the voice records of the interviews conducted with 10 participants. The Microsoft Word is used for the transcription. The qualitative data collected through the semi-structured interviews is analysed with both the inductive and deductive approach (Thomas, 2006). Deductive approach is used to analyse if the objectives determined in the design phase are functioned by the prototype or not. The objectives also guided the inductive analysis phase by providing a focus to the topics and the domains needed to be investigated. However, the findings

are enhanced from the analysis of the raw data during this inductive analysis process, and the objectives, questions and field notes provided only a guidance while analysing the data. The transcriptions were read several times. Firstly, the main themes were identified separately for each interview. After close reading and multiple interpretations of these themes, they were transformed into categories which were developed manually by using descriptive coding (Miles and Huberman, 1994; Saldana, 2009) from the raw data. These categories are organized by using Microsoft Excel. Each category consisted four key elements (Thomas, 2006). First one was 'the category label' which is a phrase or a word referring to the category. Second one was 'the description' which discern the meaning of the category. Third one was quotations related with the category. The last one was 'the links' which shows the relation of the category with the other categories. Finally, the categories were revised, and they were reduced according to their redundancy and overlap.

6.1.5. Results

In this section, the findings enhanced from the qualitative data analysis is discussed. The analysis of the data shows that the experience of the participants enhanced through the prototype differs according to their level of trust to the material. If the participant believes that the material will change according to his/her emotions or activities, the prototype functions differently from how it works for the participants who are critical about the changes of the material. Therefore, the categories of the results are examined separately for these two different participant groups in order to demonstrate how the meaning appointed to the accessory changes the experience and the function of the prototype.

During the data analysis phase, the raw data was categorized according to the objectives and the emerging themes mentioned by the participants categorized separately. These categories are used while evaluating the prototype which is developed as the product proposition. Therefore, the findings are also illustrated towards two main categories and subcategories under them.

6.1.5.1. The Functioning of The Objectives

While analysing the raw data, firstly the deductive approach (Thomas, 2006) is used to have insights about if the prototype functioned the objectives or not. Each objective is examined below according to the findings gained from the interviews.

6.1.5.1.1. To make participants to pay attention to the moment/ be aware of their emotions/ moods

One of the objectives while generating concepts was to make people pay attention to the moment. Because, to be aware of the moment elongates the remembered and experienced duration as stated in the Section 2.2.3. Moreover, to pay attention to the moment leads to the awareness about the one's mood and emotions and this is important to cope with the illusory feeling of time starvation and time pressure. Therefore, a product, which proposes to empower people suffering from chronic time pressure, should make people to be aware of the moment.

The answers demonstrated that the accessory made 6 of the participants focus on the moment time to time in three ways. The first thing which makes the participants be aware of the moment is the changes on the softness and hardness of the material. The material becomes softer or harder depending on the sweat, temperature, the moisture in the environment. 3 of the participants indicated that sometimes when they touch to the accessory and if they realize this kind of change on the material, they became aware of the moment while trying to understand what caused to this change.

> *'That week, it was quite stressful. I was working really long hours. And then I was **seeing that 'o its actually really bending** so maybe I should take it easy. **I was like I am probably really stressed** and now its bending.'*

The second thing which causes to be aware of the moment and self is the expectations of the participants from the material. 3 participants indicated that to expect that the

80

material change according to their emotions made them aware of their emotions and moods time to time.

*'...It was kind of also **giving me conscious**. Okay this is **kind of recording my momentarily stress level.** It is good because sometimes it makes me be conscious about my situation. It was with me as there is something **tells me that stay calm, don't rush** for especially these two weeks, because I had to give lectures and I was very nervous, I would say. **Sometimes it really helped me.** That giving me the feeling that something, somebody is checking you or something is take care of your mood. Just because of **your expectation** that **your mood will affect the product.**'*

3 participants indicated the other people's reactions to the accessory as an effect which makes them to be aware of the moment.

*'I was telling people, so they were also making jokes about it 'Aw look at it. Its already bended. What does it mean? Does it mean that you re angry? So, having those moments actually **made me aware of that**. Like **acknowledge my mood** and also like maybe telling it to someone else in a more lightly mood and its like in a more funny way. But I remember that I was acknowledging a lot of times that. Because I have the association of this reflecting my emotions so then I was always thinking about it. It gave some fun moments.'*

*'It's also been **a source of conversation** between my girlfriend and me. While we were having intimate moments together, yeah just holding up and **talking about it**. So, **it definitely was a provocative piece.**'*

4 participants stated that they could not realize momentarily changes on the material and mostly they forgot about the material during the day. Therefore, the material could not made them to be aware of the moment or their moods.

'I totally forget about it to be honest. I was of course feeling sometimes when I touched it was there. But just by accident. So, it was not really something planned or looking for it or something. But only the moment that I really notice that it was there the morning when I woke up and before I go to sleep. Because then you take off your clothes. Because it was inside me, so you just see it.'

Although the material made people focus on the moment somehow, none of the participants mentioned about the momentarily changes of the material as a cause which makes them to focus on the moment. On the contrary, 7 participants indicated that momentarily changes on the material were not observable.

6.1.5.1.2. To make participants to review their day/ week

The answers of the participants show that material made 60 percent of the participants to think about their day and week.

*'...**I was just reflecting on a bit** like **why that might be curling** as you say.'*

*'I can't say it made me think about time. Well, I guess that's very vague way more. Maybe it **made me consider the things I've done in my day and previous days,** but I **didn't specifically think about my time** in the right way. It's just a former is just **a visual stimulant of your activities.** '*

As mentioned in Section 6.1.3. interviews were conducted with 2 participants 1 month after they used the material. Although there had been some time after the usage phase, they could recall the events, emotions and thoughts experienced during that two weeks through looking at the changes on the material. This is an important finding that shows the traces on the material helping people to remember their past activities. However, this needs to be explored more if participants were careful about the changes on the material and kept them in their memory because of expecting to make an interview

about their experience or it was the natural effect of the accessory.

6.1.5.1.3. To make them experience new things

As mentioned in the Section 5.2. the third objective is to encourage people to experience new things in order to elongate their remembered duration. Interviews show that 60% of the participants tried to do things in order to see their effects on the material. Although, this shows that the aspect of the material, which is having changes through time, arouses curiosity on people and motivate them to try things, 2 of the participants, who tried to change the material, preferred to do experiment with it by leaving it in an environment with moisture rather than doing something with it and then seeing the effect of that activity on the material. Other 4 of the participants stated that they did sports to see how their sweat would change the material.

> *'Didn't motivate me to exercise, I was more like **enthusiastic to see the outcome for this**. Well, I guess that's the motivation at same time **I was trying to perspire more**. So, I was like I really **want to see this change'***

> *'**I was like actively trying to make myself do things** which would **make me sweat just to see what difference would be**.'*

> *'I do exercise in the morning. And yeah, I know basically where I sweat basically **where I sweat and I put it there** but what I noticed that it was*

> *completely soft so I couldn't see any change of color like it was not visible a t least to me. But yeah, **I really was curious tosee that. Okay, if I put it like in my sweat what would happen to it?** And it just became soft.'*

6.1.5.1.4. Attributing Meaning to The Accessory

The fourth objective of the product proposition is to reflect one's personal transformation through the product. Therefore, it was important to understand if the concept achieves to represent any personal meaning to the participants or not. Only 4

of the participants mentioned that they attributed meanings to the material which they used.

> '...*if I change something in life style* that cause the effect to happen. So, I would keep the interesting ones I think and you could keep them all on the same place. They could j*ust keep piling up.* And you have like a 'Memento of time'

> 'Yeah. And I think **in terms of considering like Transformations pretty cool**. Actually,yeah, if it changed more I would felt like yeah transformed more like' I've really done something transformational. Also, very interesting to see **how it changes according to like big emotional events sounds extremely sad or extremely full of love or extremely happy** or something because you really saw all of hormones and things would be interesting to see how it changes then. but I would prefer to see more a manipulation.'

The other participants did not attribute any symbolic meaning to the changes on the material except connecting the changes with bodily and environmental changes.

> 'Well basically… because it was to me directly link becoming **soft in response to humidity and then physical force**. There was no a lot of questions for me'

> '**I figured the relation with the humidity that softness** like quite like right a way. **So, it was not a mystery but like a mystery solved** but I was curious to see like, okay if the if there is this pH level of my sweat would that change its color but I couldn't really yeah…

2 participants stated how the change of the material gave them a negative feeling about the changes on their life or on their body. This shows that the type of the changes of the material is crucial in terms of the symbolic meaning that people would give to the

changes of the material.

> *'...it is now a kind of this bend **shape** '**cramped**' kind of so I was like 'okay maybe it is like an **extension of my bodily feeling.** when I was more relaxed I kinda expected the material will also be more relax. I re- membered thinking okay. I am **really stressed that why the material also kind of getting stiff and bending, getting more edgy, fragile** so it was interesting.'*

> *'... I lost my father when I started to use it. **The material was dissolving. I felt everything in my life is dissolving and getting lost like this necklace.'***

6.1.5.2. The Factors and Elements Affecting The Function of The Concept

The interviews showed which factors and elements has an effect on the experience of the participants. These factors and elements are crucial to be considered carefully while designing a product which aims to empower people suffering from chronic time pressure in terms of their power to change the function of the concept. These crucial elements and factors are introduced below.

6.1.5.2.1. The Trust to The Material

The analysis of the data shows that the experience of the participants enhanced through the prototype differs according to their level of trust to the material. If the participant believes that the material will change according to his/her emotions or activities, the prototype functioned differently from how it works for the participants who are critical about the changes of the material.

> *'No, I think I gave up under the materialrather than myself I was li ke 'probably this one just does not work' or something... I don't know… Yeah, so no, I didn't for example didn't give it to my husband just to see how it would react to his sweat. I remember, I didn't go that far'*

'I saw the materials that you used before starting to use. They were really changed. Mine didn't changed that much, so I thought maybe yours was different. I didn't try anything to change it.'

6.1.5.2.2. The Accessory Concept

The concept is designed as an accessory because of the reasons mentioned in Section 5.3. such as being close to the user and creating a symbolic meaning. To use the material as a necklace, serve the aim of the concept in different ways, such as being close to the user to be observable momentarily, nevertheless it also affects the experience and also the function of the concept negatively. Since, it is found that most of the participants perceive accessories as a personal item that needs to have a symbolic meaning or the design of it needs to reflect the person. This perception affects the function of the concept in different ways. These effects are discussed under the titles below.

*'I remember when I was washing my hands before I leave the bathroom **then you see yourself in the mirror. I was also noticing and seeing it changing** a little bit.'*

'Yeah, so I guess still necklace has a great function. It serve its purpose. I mean every night before going to bed when I brush my teeth directly see it.'

Although the accessory concept has advantageous, the comments of the participants during interviews revealed that the accessory concept has also some drawbacks which affects the function the objectives.

The Way of Changing of The Accessory

The first factor which affects to the function of the concept is how the material changes. In design phase, the aim is considered as to design a product which changes through time depending on the experiences of the user in order to represent the

transformation and the growth of the user through time. However, the findings from the interviews revealed that how the type of the changes affects the function of the product but also the perception of the user about the product.

Figure 6.4. Two materials used by one of the participants for two weeks. (The first one shows two material pieces before usage. The middle and the right demonstrated how these two pieces changed after usage for one week.)

8 participants indicated that they *do not prefer a shape change* on their accessory. Since, the shape change on the material changes the whole appearance of the accessory as shown in the figure 6.4. Participants also stated that the changes on colour is more desirable rather than the shape changes.

> *'it changes too much from what it is... I don't know but maybe just aesthetically looks a bit like a leaf so it's nice but it also looks a bit... Yeah... Maybe even too organic, I don't know...'*

> *'Its super important that **it changes on the style that I like not changes on***

*the style that the designer like. So, **if the changes are not desired ones per say… I probably wouldn't wear it**. But… I think **the shape change is quite huge in terms of change**. Because the whole shape of your accessory is changing whereas only the colour, texture, you know, just minor changes probably… But I think **this is too much, the change**.'*
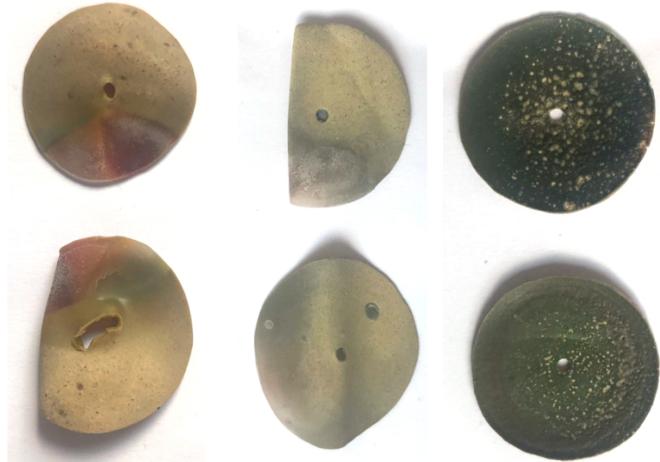
Figure 6.5. different participants' two materials used for one week each

This shows that it is not enough just being changed according to the person's emotions and experiences, but also *the type of the changes needs to be considered while designing a product as an accessory.*

The Duration of The Usage of one 'Time Piece'

The duration of the usage of one 'Time Piece' is one of the elements of the concept. The routines or rituals of a person can change day to day in a week according to one's work or leisure time. However, week is a time period that ones' routines and rituals are repeated. Therefore, week is chosen in the idea generation phase (section 5.3.) as the smallest time period which would contain the same routines and practices such as, weekday and weekend routines. The aim was to show people even if they practice the same routines and rituals, every day is unique in terms of how they feel. Hence, the evaluation study is conducted for two weeks to see the effect of showing people that

even if they feel they practice the same things every week, they feel differently every day through the material which changes by their bodily changes caused by their emotions. However, this proposed affect was not mentioned by the participants. They only assessed the duration to use one 'Time Piece' in terms of the advantage of reviewing their time or disadvantage to develop attachment with the accessory.

> '...I can feel that one week is a bit maybe too short to attach to something. But on the other hand, it's good... **Short period of time, then you can somehow you remember what you have been doing during that week** and then you can label it for... I don't know... That week for example, **I was in Mallorca and this was the result.** So that is something I like.'

> 'Well, I think a week it is not enough. I would like to keep this more (shows the less changed piece), because I liked the shape, I liked the fact that it looks natural.'

Participants could recall their experiences by looking at the material pieces. When their opinion asked about the duration of the usage of one material, they all indicated that using the material for one week makes possible to link the changes with specific events. However, most of the participants indicated that they would like to use one piece to attach themselves with the material. In addition, they indicated if they use it as an accessory, they prefer to use it longer period rather than changing it every week. Therefore, the duration of the usage of one material should be explored further in terms of ideal time to make people able to remember the related event which causes the changes while reviewing the week and to make people to facilitate an attachment with the material.

6.1.5.2.3. The Impression of The Material

The findings from interviews show that the first impression about the material is positive and this leads to start using the accessory with positive emotions and relations.

'I loved the can, I loved the texture. I loved the feel of the thing. It was beautiful.'

*'Especially I l***ike the color!*** *The color* ***really suits****. It* ***reminds me the ocean****. It* ***really makes me calm****. When the moment I saw that, and especially when you told me about the sea shells, I just had* ***an imagination of the ocean*** *and all those things. I like this very much!*

'The material is very nice. It Looks natural. It has this slide you know… Imperfections… Its smooth… I really liked it. The shades of the colours… The texture… It is also quite nice to touch.'

All participants indicated that they liked the first appearance of the accessory. The material is associated with 'nature', sea, calmness by the participants. This shows that *the impression of the product should align with the purpose of the product.* However, as mentioned in previous sections, the way of changing the material changes this positive impression and gives the feeling that the material and accessory is decaying.
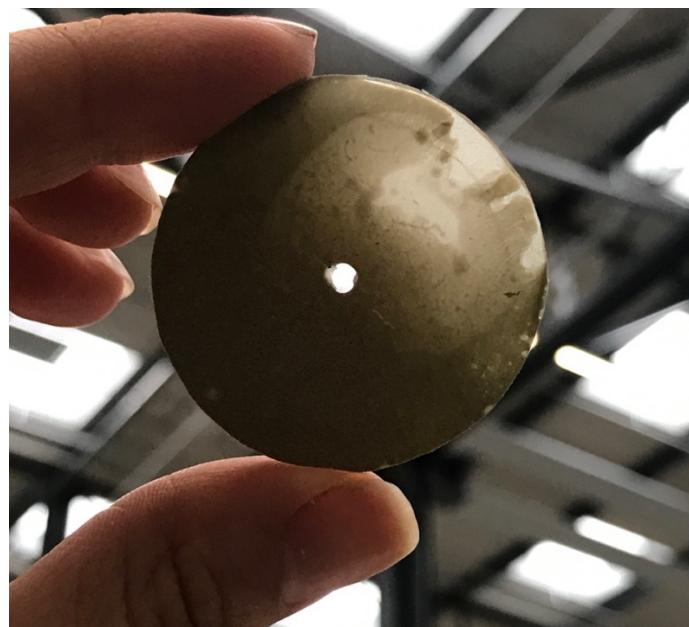
Figure 6.6. One of the materials used in the study before changing

6.1.5.2.4. The Social Interaction Effect

The interviews showed that there is also a *social effect that has an influence on the experience of participants* while using the prototype. To see the others' 'time pieces' or to be seen by the others or the desire to share how their 'time piece' changes over time have different effects on the behaviours of the people. Therefore, this is an important element to be considered and maybe added to the product proposal.

> *'She showed me hers, and it was like… Have you seen hers? It was crazy. It was like curled. Just like bend quite extensively. Then the inside was like super textured like really rough many craters that you see on the moon and like that really just…Really different. She is probably more stressed than I am. She is running a course, has two children and there's lot going on. So, yeah, I guess I was not envious, but I was interested, because I was like, what can I do to make it like that which I think might be the motivation. The exercising and stuff like that.'*

> *'wow, that's a big difference between me and her. Okay. Yeah, it will be interesting to see what our second ones like. When I think seeing them together will be very fun to see everyone has individual and make comparisons.'*

> *'I don't wear that much like a jewerly or whatever. So, this was something that was always hidden, and I was the only one that I have it and knows what's going on. So, the idea of sharing it with someone else is nice. What it does…'*

CHAPTER 7

CONCLUSION

In this chapter, the aim of the study, methodology and research findings are presented briefly as an overview of the study. In addition, some research directions recommended for further studies.

7.1. Overview of The Study

Chronic time pressure is a pervasive problem which affects people's lives from many different aspects (Section 2.2.2); therefore, it is crucial to overcome this phenomenon to improve quality of life and help human flourishing. The goal of this project was to investigate chronic time pressure phenomenon and how design can help to empower people to overcome this chronic experience in order to improve their subjective well-being by using research through design approach. This approach helped to use distinct ability of design practice to handle with many different factors and answer the research questions below.

The aim of this explorative study, firstly to aggregate the knowledge provided by the studies in the literature by different fields in order to provide an comprehensive overview of chronic time pressure phenomenon that includes the reasons, results of the chronic feeling of time pressure and time shortage, and strategies to cope with this negative experience. Secondly, this study purposed to provide a source for designers who would design products and services for people, who suffer from time scarcity and time pressure constantly, by determining the requirements of products and services to empower people against time pressure through the knowledge gained and by demonstrating ways to adapt these strategies to product or services. The findings gained from this study can be used as a starting point by the designers who wants to design products or services to empower people against chronic time pressure

phenomenon. The designed and tested concept should be seen as an example which aims to show a way to adapt the requirements which are needed to be function by the products which aims to empower people who suffer from chronic time pressure.

According to the findings from evaluation study, potential ways to adapt the strategies or the weaknesses of current adaptation style is indicated. These recommendations can be used for further studies which would like to investigate the potentials of current suggested strategies. The figure 7.1. summarises the findings. In addition, the overall findings from literature review and preliminary studies present a comprehensive perspective by demonstrating knowledge related with time and time pressure from many different fields. Therefore, this study also can be used as a source by designers and research to understand the chronic time pressure phenomenon.

REQUIREMENTS	FUNCTION	FINDINGS FROM	PROPOSED ADAPTATION	HOW IT FUNCTIONS? (Findings)		UNEXPECTED FACTOR & FUNCTION
				The Effects	Needs To be Explored	
To make participants to pay attention to the moment/	Elongates perceived time; Become aware of details, increase the processed information - elongates remembered duration; be aware of their emotions/ moods makes people to take action	Literature review; Preliminary Studies - Explorative Interviews	Momentarily changing material according to the emotions and experiences of the person	The softness/ hardness made people be aware of the moment; To realize being stressful make people to try get relax	Observable momentarily changes; The potential of social interaction	**Social interaction Factor:** The comments of the other people make people to pay attetion to the emotions and moods; The Expectations about the material make people observe the material constantly and be aware of the moment
To make participants to review their day/week	To become aware of activities and experiences arose the feeling of not consuming time	Preliminary Studies - Explorative interviews	Keep traces of emotions and activities through the changes on the material	When people see the piece they remember the reasons of the change	More distinctive changes are needed for every different input	
To make them experience new things	Elongates remembered time	Literature Review	Arouse curiosity how the material would be affected by new factors	Arosed curiosity and encourage people to do things		**Peer Pressure/ Motivation:** to see how the other people's materials has cahanges motivates people to things
Attributing Meaning	Creates positive perception about time - changes illusory feeling of time pressure and time shortage	Preliminary Studies - Comparison of Current Product and Concepts	Material changes uniquely for each person according to their emotions and experiences - Tangible representation of one's transformation	The of changing the material arosed some meanings but not about time itself	The duration is not enough to develop personal attachment; Which kind of changes cause which kind of meanings	Shape changes are found too much and unexpected for an accessory

Figure 7.1. The summary of the findings

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7.2. Prominent Conclusions: Answers of The Research Questions

The main research question of the study was 'How can design help to empower people, who suffer from chronic time pressure, to overcome this chronic feeling in order to improve their subjective well-being?'. In order to answer this main question, 3 sub-questions were answered through literature research, preliminary studies and evaluation study. Research through design approach helped to combine the knowledge from different fields by using design activities. One product concept sample is generated in order to use it to generate knowledge to answer the main research question. The main aim of testing this concept with actual users was to identify ways to adapt recommended strategies to product concepts. There is still a need to conduct a longer study which could reveal how design can empower people against the feeling of time pressure rather than performing recommended strategies, such as by changing the perception about time in a positive way.

The three sub-questions and the findings which answers these sub-questions and the main research question are presented below.

7.2.1. What are the strategies to overcome chronic time pressure?

The literature research focused on 'what can be used as strategies against chronic feeling of time pressure?'. However, to answer this question it is crucial to understand the context of chronic time pressure deeply. Therefore, literature research started with exploring the history of time keeping in order to discern when the experience of time pressure started to occur in daily lives and what agents caused this negative experience. After examining the changes in perception about time through history, the proposed reasons for the experience of chronic time pressure were explored through reviewing the studies conducted in different fields. The findings revealed that there are different factors proposed as the reasons of the experience of time pressure in the literature. While there are studies that indicates busy schedules, deadlines, frantic pace of life as the reasons of the feeling of time pressure, there are also studies which claims that the experience of time pressure and time starvation is a 'self-deceptive' feeling.

According to these studies this ' illusory' feeling of time pressure occurs as a results of growing number of options and the inadequacy of time to pursue all these options or it is caused by getting used to network speed and time inducing technology, which creates a time pressure on people and impatient experience because of the expectation that everything needs to be in shorter time. Literature review also showed that chronic time pressure comprises two overlapping components which are chronic time shortage and constantly being rushed. Although chronic time shortage is a measurable problem related with time allocation, chronic feeling of being rushed is more complex than just being a time allocation problem. It is an emotional experience of hectic pace of time which leads the feeling of time starvation. This demonstrated that the feeling of time shortage and the experience of time pressure is not only a problem related with time allocation and cannot be solved only by time productivity tools. These findings urged to understand how we perceive time and is it possible to elongate the perceived time. Psychology and cognitive science literature provided knowledge about how time is perceived, how the perceived duration changes and how perceived duration can be manipulated. This showed that time is a function of the brain and the perceived duration is related with the information processing. Therefore, time can be made feel longer in the moment (experienced duration) or in the memory (remembered duration) by the strategies; such as, *breaking routines, having new experiences, learning new things, focusing on the moment, actively noticing new things or details* (Section 2.2.3.*).*

After literature research, preliminary studies also gave insights about the strategies which can be used to overcome the chronic feeling of time pressure or time shortage.

Exploratory interviews showed that *reviewing a certain period of time* such as a day, week, month helps to realize the activities, experiences, accomplished things and this gives the feeling of satisfaction and fulfilment about the time usage rather than the feeling of consuming time (Section 4.1.3.2.2.). The other important strategy occurred from interviews was to *become aware of the emotions and moods*. Since, when people become aware of the moment, they start to be more conscious about the situation

(Section 4.1.3.2.2.). This finding is also supported by the evaluation study. To be aware of the emotional state helps people to be conscious about the situation and take action about the negative experience caused by the feeling of time pressure or time scarcity (Section 6.1.5.1.1.).

This iterative knowledge generation process helped to identify the strategies and these strategies were used to answer the next sub-question that is 'What are the requirements for a product or a service to empower people, who suffer from chronic time pressure to improve their subjective well-being?'

7.2.2. What are the requirements for a product or a service to empower people, who suffer from chronic time pressure to improve their subjective well-being?

In order to answer this question, after explorative interviews, time related concepts and designs are reviewed to understand if they offer strategies to cope with this phenomenon and how they frame the concept of time. Current designs and concepts were compared to discern what are the possible solutions or themes to create a product which could help people, who suffers from this phenomenon. The comparison demonstrated that *the way of framing the concept of time* is crucial in terms of the type of the experience enhanced through that product or concept. Therefore, *the representation of time should give positive meanings*. This insight and other findings from research and design activities were summarized and transformed into objectives. These objectives were determined as the requirements that are needed to be function by the products or services which would help to empower people suffering from chronic feeling of time pressure and time shortage.

As explained in Chapter 5, a product can empower people by making them *be aware of the moment* or by making them to *review their day, week, month and year,* or by encouraging them to *experience new things*. Moreover, the way of framing the concept of time is crucial to prevent the feeling of time pressure and time starvation. Therefore, it is required that the *product should not arose the associations that time is something consumed, limited, be wasted and something people spent.* On the contrary, *the way*

of representation of time should give positive meanings and show the gain of people through time. Detailed information about the strategies and the objectives can be found in Chepter 2 and Chapter 4.

7.2.3. How the requirements for a product or a service to empower people, who suffer from chronic time pressure can be adapted to a product?

In order to answer this question, as introduced in previous chapters, one final concept is developed as a product proposition by adapting proposed requirements for products and services which would empower people, who suffer from the experience of chronic time pressure, to cope with this phenomenon. The prototype of this product proposition is evaluated through an evaluation study. This study evaluated how determined product proposal functions the objectives. The findings from this study provided a guidance which shows how determined requirements can be adopted to a product by revealing strong and weak aspects of current product proposal in terms of functioning the objectives. More information about the evaluation of every aspect of the proposed concept can be found in Section 5.1.5.

7.2.3.1. 1st Objective: Make people pay attention to the moment

Tested product proposal used a material which momentarily change according to the person's personal experiences to function first objective. Although it is hard to observe the changes on the material momentarily, the expectation that the material would change with the emotions and activities of the person made participants to pay attention to the moment. This was one of the ways to adapt this objective to a product in order to function this objective and evaluation study showed that there is a potential to use momentarily changes to make people be aware of the moment.

7.2.3.2. 2nd Objective: Make people review their time

The proposed concept used the traces or any changes on the material as the signs of the activities and emotions of the person. Thus, people would review their time by trying to understand the effects which causes these changes.

To link the person's time usage with something which changes according to one's time usage was the tactic to adapt this objective into tested product proposition. The evaluation study indicated that to make one's experiences and emotions gained through time tangible motivates people to review their time usage.

7.2.3.3. 3rd Objective: To make people to experience new things

This objective is adapted to tested product position by using curiosity as a factor which would encourage people to experience new things in this product proposal. The unknown changes on the material made people to wonder how their next action would affect the material, thus, they became motivated to try new things. The important issue needed to be considered for similar adaptations.

7.2.3.4. 4th Objective: Attributing Meanings

As indicated in Section 5.2.4., it is important to create positive meanings while representing time in order to arose positive experiences about time. Tested product concept proposed to show person's personal transformation through time by using a material which changes according to one's emotions and experiences in order to show time passing rewarding and create positive meanings about the passage of time. However, evaluation study showed that the type of the changes has a crucial role in terms of the associated meanings through the changes. Therefore, this needs to be considered if this objective would be used in a product in this way.

7.2.4. Main Research Question: How design can help to empower people, who suffer from chronic time pressure, to overcome this chronic feeling in order to improve their subjective well-being?

Literature shows that there are strategies can be used to empower people against the feeling of time scarcity and time pressure. In addition, the perception created about time affects the feeling of time scarcity and time pressure. This study showed that these strategies can be adapted into daily lives by the help of design. As the answer of this question it can be indicated that design can empower people by making them to use these strategies through products. In order to understand how design also help

people by changing the perception about time in a positive way, there is a need to conduct further studies. Since, long term effect of the proposed design concept after collecting 'time pieces' could not be observed because of the time limitation of the study. Although, some of the participant tended to give meanings to the product, two weeks study is not enough to observe how it affected the time perception of people. The study only evaluated if the recommended strategies can be functioned in daily life by using design concepts in order to create an example for designers who would like to design products or services for people who suffers from this phenomenon. Therefore, there is still a need for studies in order to observe how design can change the perception about time in a positive way.

7.3. Recommendations for Further Research

The purpose of this study to investigate the chronic time pressure phenomenon further to propose a guidance for designers who would design products or services to empower people suffering from the chronic experience of time pressure and time scarcity in order to improve the subjective well-being of them. As mentioned in previous chapters, after iterative knowledge generation process, the findings guided to define objectives that are needed to be functioned by products or services to empower people to overcome chronic time pressure. These objectives lead to create a product proposal which proposed to function these objectives. The prototype of this concept is tested with actual users through an evaluation study. This evaluation study gave insights about which aspects of this generated product proposal are needed to be explored further in order to function the determined objectives.

Firstly, to investigate the effects of momentarily changes, which would take attention of the person without requiring any effort, is important. The changes on the material proposed in generated product proposal aimed to make people be aware of their emotional changes or the changes in their environment. However, the changes on the material used in the study were not observable momentarily without paying attention. Participants were paying attention to their emotions or the environmental changes

because of expecting the material would change according to them or because of the comments of other people about the changes on the material. Therefore, it is still needed to be tested how noticeable momentarily changes would affect people.

Secondly, type of the change on the material is needed to be investigated more in terms of its effect on attributed meanings to the material and aesthetical appearance of the accessory. The evaluation study showed that people tend to give symbolic meanings to the change on the material according to the type of the changes (Section 6.1.4.1.4.). In order to prevent the creation of negative associations, how the material should change is needed to be explored further. Secondly, evaluation study revealed that to use this material as an accessory creates a requisite for the material that is being aesthetically appealing. Some of the participants indicated that they do not prefer changes on the shape of their accessory, since shape change has a powerful effect on the whole appearance of the accessory. Therefore, they stated that it is important to be able to predict how the accessory would seem after it changed. Otherwise, if the new appearance of the accessory is not pleasurable for them, they indicated that they would not want to continue using it (Section 6.1.4.1.4.). Therefore, which kinds of changes, such as, shape, color, texture, are aesthetically pleasurable requires a further research.

The other issue which requires a further study is the duration of the usage of one 'Time piece'. The evaluation study elucidated that to use each material piece for one week helps people to review their week and remember their activities by the traces on the material. Because, after a week, people can still remember even the details about the past week when they think about their experiences. However, most of the participant indicated that it is not enough to create a personal attachment with the accessory. One of proposed effects of the concept was to make people see the accessory as the reflection of their transformation through time. Although, some of the participants mentioned about the meanings that they attributed to the material, they all indicated that one week is not enough to get attached with the accessory. In addition, they all indicated that they would like to use the accessory for longer period of time rather than

changing it every week. These findings elucidated that the amount of time which is ideal for both remembering the events causing the changes on the material and facilitating a personal attachment with the accessory is still needed further exploration.

There are one more duration related further study recommendation. The product proposal tested in a study for two weeks because of the time limitations of the project. However, one of the aspects of the concept was to collect 'Time Pieces' for a year. This is proposed to make people to review their months and one year and create a tangible representation of their one year. To conduct a study for longer than two weeks is also important in terms of observing if the functions of proposed aspects would function and if the tested aspects of the concept would change or fade out after a certain period of time.

Finally, it is important to mention that the objectives determined through the iterative research process adapted as a product proposal in the form of accessory. However, evaluation study illustrated that to function the objectives through an accessory concept, affected proposed functions of the objectives. Since, some additional factors became consideration which affects the experience such as, personal taste, attachment, social interaction (Chapter 6). Therefore, it is crucial to test these objectives with another concept except an accessory. Because, this would remove the requirements of being accessory.

REFERENCES

Aho, K. A. (2007). Acceleration and Time Pathologies: The critique of psychology in Heidegger's Beiträge. *Time & Society, 16*(1), 25–42. https://doi.org/10.1177/0961463X07074100

Ashby, M., & Johnson, K. (2009). *Materials and Design: The Art and Science of Material Selection in Product.* Oxford, UK: Butterworth-Heinemann.

Bardzell, S., Bardzell, J., Forlizzi, J., Zimmerman, J., & Antanitis, J. (2012). Critical design and critical theory. *Proceedings of the Designing Interactive Systems Conference on - DIS 12*. doi:10.1145/2317956.2318001

Bianchi, S. M., Casper, L. M., and King, R. B. (2012). *Work, family, health, and well-being.* New York: Routledge.

Binder, T. and Johan Redström, J. (2006). *Exemplary Design Research*. In Proceedings of Wonderground. Design Research Society.

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., et al. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 11*, 230–241.

Biswas-Diener R. (2009). Material wealth and subjective well-being. University of Tromsø, Faculty of Social Sciences, Department of Psychology.

Block, R., and Zakay, D. (2004). Prospective and retrospective duration judgments: An executive-control perspective. *Acta neurobiologiae Experimentalis, 64*(3), 319-28

Brown, K. W., & Kasser, T. (2003). Are Psychological and Ecological Well-Being Compatible? The Role of Values, Mindfulness, and Lifestyle. *Social Indicators Research*. 74(2), 349-368.

Buchanan, R. (1995). *Wicked Problems in Design Thinking. In The Idea of Design.* Cambridge, Mass: MIT Press. 3-20.

Cross, N. (1999*)* DesignResearch: A Disciplined Conversation. *Design Issues* 15(2), 5-10.

Csikszentmihalyi, M. (1997). *Finding flow: The psychology of engagement with everyday life.* New York, NY: Basic Books.

Dapkus, M. A. (1985). A thematic analysis of the experience of time. *Journal of Personality and Social Psychology*, 49(2), 408-419.

Desmet, P., & Hassenzahl, M. (2012). Towards Happiness: Possibility-Driven Design. *Studies in Computational Intelligence Human-Computer Interaction: The Agency Perspective,* 3-27. doi:10.1007/978-3-642-25691-2_1

Desmet, P. M. A., and Hekkert, P. (2007). Framework of product experience. *International Journal of Design*, 1(1), 57-66.

Desmet, P. M. A., and Pohlmeyer, A. E. (2013). Positive design: An introduction to design for subjective well-being. *International Journal of Design*, 7(3), 5-19.

Desmet, P., & Hassenzahl, M. (2012). Towards Happiness: Possibility-Driven Design. *Studies in Computational Intelligence Human-Computer Interaction: The Agency Perspective,* 3-27. doi:10.1007/978-3-642-25691-2_1

Diener E. (2000), Subjective well-being: The science of happiness and a proposal for a national index*, American Psychologist*, 55, 34-43.

Dunne, A., & Raby, F. (2001). *Design noir: The secret life of electronic objects.* Basel: Birkhäuser Verlag AG.

Eriksen, T. H. (2001). *Small Places, Large Issues - Fourth Edition An Introduction to Social and Cultural Anthropology.* London: Pluto Press.

Epstein, M. (1995). *Thoughts without a thinker: Psychotherapy from a Buddhist perspective*. New York: Basic Books.

Eurostat. (2004). *How Europeans Spend Their Time: Everyday Life of Women and Men*. Luxembourg: European Communities.

Fokkinga, S., and Desmet, P. (2012). *Darker Shades of Joy: The Role of Negative Emotion in Rich Product Experiences, 28 (4),* 42-56. doi:10.1162/DESI_a_00174

Forlizzi, J., and Battarbee, K. (2004). Understanding experience in interactive systems. Proceedings of the 5th Conference on Designing Interactive Systems, 261-268. New York, NY: ACM Press.

Frayling, C. (1993). *Research in Art and Design*. Royal College of Art Research Papers 1 (1) ,1-5.

Hassenzahl, M. (2010). Experience Design: Technology for All the Right Reasons. *Synthesis Lectures on Human – Centered Informatics , 3*(1), 1-95. doi:10.2200/s00261ed1v01y201003hci008

Hassenzahl, M., Eckoldt, K., Diefenbach, S., Laschke, M., Len, E., & Kim, J. (2013). Designing Moments of Meaning and Pleasure. Experience Design and Happiness*, International Journal of Design*, 7(3).

Haworth, J., and Lewis, S. (2005). Work, Leisure and Well-Being. *British Journal of Guidance and Counselling,* 67-79. doi:10.1080/03069880412331335902

Haworth, J. T., & Veal, A. J. (2004). *Work and leisure*. London: Routledge.

Haworth, J. T., and Iso-Ahola, S. E. (2005). *Self-help Books on Avoiding Time Shortage*. London: Routledge.

Haworth, J. T., and Lewis, S. (2005). Work, leisure and well-being. *British Journal of Guidance and Counselling.* doi:10.1080/03069880412331335902

Ho, L. S. (2013). *The Psychology and Economics of Happiness: Love, life and positive living.* New York, NY, US: Routledge/ Taylor & Francis Group. doi:10.4324/9781315887463

Honore, C. (2005). *In Praise of Slowness:Challenging the Cult of Speed*. HarperOne.

Horrigan, M., and Herz, D. (2004). Planning, designing, and executing the BLS American Time-Use Survey. Time-Use Survey. Monthly Labor Review. 3.

Höök, K., & Löwgren, J., (2015). *Strong Concepts. ACM Transactions on Computer Human Interaction, 19(3)*. 1-18. doi:10.1145/2362364.2362371

Gaver, W. (2012). What should we expect from research through design*? Proceedings of the 2012 ACM Annual Conference on Human Factors in Computing Systems - CHI 12*. doi:10.1145/2207676.2208538

Gergen, Kenneth J. (1991). *The Saturated Self: Dilemmas of Identity in Contemporary Life*. New York: Basic Books.

Giaccardi, E., Cila, N., Speed, C., & Caldwell, M. (2016). Thing Ethnography. *Proceedings of the 2016 ACM Conference on Designing Interactive Systems - DIS 16*. doi:10.1145/2901790.2901905

Goodin, R. E., Bittman, M., Rice, J. M., & Saunders, P. (2005). The Time-Pressure Illusion: Discretionary Time vs. Free Time. *Social Indicators Research*. doi:10.1007/s11205-004-4642-9

Graaf, J. D. (2003). *Take back your time: Fighting overwork and time poverty in America*. Readhowyouwant.com.

Grondin, S. (2008). *Psychology of time*. Bingley, UK: Emerald.

Ingold, T. (2013). *Making: Anthropology, archaeology, art and architecture*. London: Routledge.

Jacobs, J. A., and Gerson, K. (2004). *The time divide: Work, family, and gender inequality*. Cambridge, MA: Harvard University Press.

Kahlert, H., Mühe, R., and Brunner, G. L. (1986). *Wristwatches: History of a Century's Development*. Schiffer Pub.

Kahneman, D. (1973). *Attention and effort*. Englewood Cliffs, Nj: Prentice-Hall.

Karana, E., Pedgley, O., and Rognoli, V. (2014). *Materials Experience: Fundamentals of Materials and Design.* San Diego: Butterworth-Heinemann Imprint.

Koskinen, I., Zimmerman, J., and Binder, T. (2011). *Design research through practice: From the lab, field, and showroom*. Elsevier.

Landy, F. J., Rastegary, H., Thayer, J., & Colvin, C. (1991). Time urgency: The construct and its measurement. *Journal of Applied Psychology, 76*(5), 644-657. doi:10.1037/0021-9010.76.5.644

Levine, R. (1997). *Geography of Time: The Temporal Misadventures of a Social Psychologist, or How Every Culture Keeps Time Just a Little Bit Differently,* Oxford: Oneworld.

Lopez, S. J., and Snyder, C. R. (Eds.). (2009). *Oxford handbook of positive psychology*. New York, NY: Oxford University Press.

Lyubomirsky S., (2008). *The how of happiness: a scientific approach to getting the life you want*. New York: Penguin Press.

Manzini, E. (1986). *The material of invention: materials and design*. London: Design Council.

Mayer H., Knox P.L. (2009). *Pace of Life and Quality of Life: The Slow City Charter*. 1. Springer, Dordrecht

Menzies, H. (2005). *No Time: Stress and the Crisis of Modern Life*. Vancouver, B.C: Douglas and Macintyre.

McCarthy, J., and Wright, P. (2004). *Technology as experience*. Cambridge, MA: MIT Press.

Miles, M. B., and Huberman, M. A. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks: SAGE Publ.

Norgate, S. (2006). *Beyond 9 to 5: Your life in time*. London: Phoenix.

Nowotny, H. (1994). *Time: The modern and postmodern experience*. Cambridge, UK: Polity Press.

O'Connor, P. (2006). Mental Energy: Assessing the Mood Dimension. *Nutrition Reviews* 64(3). https://doi.org/10.1111/j.1753-4887.2006.tb00256.x

Ornstein, R. E. (1969). *On the experience of time*. Middlesex: Penguin.

Pouthas, V., & Perbal, S. (2004). *Time perception depends on accurate clock mechanisms as well as unimpaired attention and memory processes*. Acta Neurobiol Exp, *64*, 367-385.

Putnam R. (2000*). It's About Time; Who has time to enjoy family life, connect with the community or be an active citizen?*. The San Francisco Chronicle, Publisher's Version

Rittel, H. W. J. and Webber, M. M. (1973). Dilemmas in a General Theory of Planning. *Policy Sciences*, 4, 155-169.

Robert, H., and Purser, R. (2007). 24/7: *Time and temporality in the network society.* Stanford: Stanford University CA: Stanford Business Books, An Imprint of Stanford University Press.

Robinson, J. P. and Godbey, G. (1999) *Time for Life: The Surprising Ways Americans Use Their Time.* University Park, PA: Pennsylvania State University Press.

Rognoli, V and Levi, M (2004) How, what and where is possible to learn design materials? *International engineering and product design education conference*, 647-654.

Roxburgh, S. (2004). There Just Aren't Enough Hours in the Day*:* The Mental Health Consequences of Time Pressure. *Journal of Health and Social Behavior.* 45(2), 115-131. doi:10.1177/002214650404500201

Rudd, M., Aaker, J. L., and Vohs, K. D. (2012). *Awe expands people's perception of time, alters decision making, and enhances well-being.* Stanford, CA: Stanford Graduate School of Business.

Saldaña, J. (2009). *The coding manual for qualitative researchers.* Los Angeles: Sage

Sanders, E. B.-N., and Stappers, P. J. (2012). *Convivial design toolbox: Generative research for the front end of design.* Amsterdam: BIS.

Schwartz, B. (2004). *The paradox of choice: Why more is less.* New York: Harper Collins.

Seligman M. E. P., (2001). *Flourish: a new understanding of happiness and well-being: and how to achieve them.* London: Nicholas Brealey.

Seligman, M. E. P., (2011). Flourish: A visionary new understanding of happiness and well-being. *Choice Reviews Online, 48*(12). doi:10.5860/choice.48-7217

Seligman, M. E. P., and Csikszentmihalyi, M. (2000). Positive Psychology: An introduction. *American Psychologist*, 55(1), 5-14. doi:10.1037/0003-066X.55.1.5

Seligman M. E. P., Steen T. A., Park N., and Peterson C.,(2005). Positive Psychology Progress: Empirical Validation of Interventions, *American Psychologist*, 60, 410-421.

Selye, J. (1952). *The story of the adaptation syndrome: Told in the form of informal, illustrated lectures*. Montréal: Acta.

Stappers, PJ (2007). *Doing design as a part of doing research*. Basel: Birkhauser. pp: 81-91.

Steger, M. (2006). *The meaning in life questionnaire: Assessing the presence of and search for meaning in life*. Journal of Counseling Psychology.

Stappers, P. J. and Giaccardi, E., (2018). *Research through Design*. Interaction Design Foundation.

Stetson, C., Fiesta, M. P., & Eagleman, D. M. (2007). Does Time Really Slow Down during a Frightening Event? *PLoS ONE, 2*(12). doi:10.1371/journal.pone.0001295

Szalai, A., Converse, P. E., Feldheim, P., Scheuch, E. K. and Stone, P. J. (1972). *The Use of Time: Daily Activities of Urban and Suburban Populations in Twelve Countries*. The Hague: Mouton.

Szollos, A. (2009). *Toward a psychology of chronic time pressure: Conceptual and methodological review*. Philadelphia: University of Pennsylvania Press.

Tashakkori, A., & Teddlie, C. (2003). *Handbook of mixed methods in social & behavioral sciences*. Thousand Oaks, CA: SAGE Publications.

Thomas, D. R. (2006). A General Inductive Approach for Analyzing Qualitative Evaluation Data. *American Journal of Evaluation, 27*(2), 237-246. doi:10.1177/1098214005283748

Thomas, E. A., and Weaver, W. B. (1975). Cognitive processing and time perception. *Perception & Psychophysics, 17*(4), 363-367. doi:10.3758/bf03199347

Thompson, E. P. (1967). *Time, Work-Discipline, and Industrial Capitalism*. Past & Present, 38(1), 56-97. https://doi.org/10.1093/past/38.1.56

Totterdell, P., and Parker, S. (1999). *Rushed, unhappy, and drained: An experience sampling study of relations between time pressure, perceived control, mood, and emotional exhaustion in a group of accountants*. PubMed. doi:10.1037//1076-8998.4.1.37

Treisman, M. (2013). *The Information-Processing Model of Timing*. Timing & Time Perception, *1*(2), 131-158. doi:10.1163/22134468-00002017

Tse, K., and Intriligator, J. (2004). *Attention and the subjective expansion of time*. Oxford: Percept Psychophys.

Wensveen, S. and Matthews, B., (2014). *Prototypes and prototyping in design research, in The Routledge Companion to Design Research*. Routledge Handbooks Online.

Wiltse H. (2014). Unpacking digital material mediation. *Techné: Research in Philosophy and Technology* (18) 3: 154-182

Zacarias M. and Oliveira J. V. (2012). Human-Computer Interaction: The Agency Perspective. 3–27. Springer.

Zakay, D., and Block, R. A. (1996). Temporal Cognition. *Current Directions in Psychological Science*. doi:10.1111/1467-8721.ep11512604

Zakay, D., and Block, R. A. (2004). *Prospective and Retrospective Duration Judgments: An Executive-control Perspective, 64*(3), 319.

Zakay, D., Tsal, Y., Moses, M., & Shahar, I. (1994). The role of segmentation in prospective and retrospective time estimation processes. *Memory & Cognition, 22*(3), 344-351. doi:10.3758/bf03200861

Zimmerman J, Stolterman E, and Forlizzi J (2010). *An analysis and critique of research through design: toward a formalization of a research approach*. DIS 2010, 310 - 319.

Zimmerman, A. S. (2003). *Data sharing and secondary use of scientific data: Experiences of ecologists.*

Zimmerman, J., Forlizzi, J. and Evenson, S. (2007). *Research through Design as a Method for Interaction Design Research in HCI*. In Proceedings of CHI. ACM Press, 493-502.

Zuzanek, J. (2004). *Work, leisure, time-pressure and stress*. London: Routledge.

APPENDICES

A.   The Time Pressure Scale

Time Pressure: In the last twelve months how often have you felt…

(1-4, "strongly agree"t o "strongly disagree")

1. You never seem to have enough time to get everything done.

strongly
disagree

strongly
agree

1   2   3   4

2. You feel pressed for time.

strongly
disagree

strongly
agree

1   2   3   4

3. You are often in a hurry.

strongly
disagree

strongly
agree

1   2   3   4

4. You feel rushed to do the things that you have to do.

strongly
disagree

strongly
agree

1   2   3   4

5. You have enough time for yourself.

strongly
disagree

strongly
agree

1   2   3   4

6. You feel that too much is expected of you.

strongly
disagree

strongly
agree

1   2   3   4

7. You worry about how you are using your time.

strongly
disagree

strongly
agree

1   2   3   4

8. You are always running out of time.

strongly
disagree

strongly
agree

1   2   3   4

9. There just don't seem to be enough hours in the day.

strongly
disagree

strongly
agree

1   2   3   4

B. Evaluation Study Interview Questions

EVALUATION STUDY

Focus group:

People who experience time pressure recurrently in their daily life. (Chronic time pressure)

The main proposed effects of the concept:

1 Make them focus on the moment/details,

2 Make them review the day/week/time usage,

3 Encourage them to have new experiences,

4 Represent their transformation,

Procedure:

Participants will be determined through time pressure scale. They will be informed about the concept and the qualities of the material. After they use the material for two weeks, semi-structured interviews will be conducted with each participants.

The instruction:

Every day is a new chance for our transformation. Even if we do the same things, we experience many different emotions during the day and we change. Time is not something we lose or spend every day; it is something gains and makes us who we are by the experiences and emotions engaged through time.

The aim of the project is to make visible your transformation by making legible your experiences and emotions which turn you 'who you are'. This material changes its shape, texture and colour according to environmental and your bodily changes.

Interview questions:

Would you like to talk about your experience during two weeks?

(Make them focus on the moment, make them review the day/week)

Could you observe the changes on the material? When it changed? Were the changes momentarily noticeable?

How observing the changes on the material affected you?

Did your daily practices were affected by it? How?

(Encourage them to have new experiences)

Have you done/try something different from your daily routine in order to observe the effect of it to the material?

(Make them review the day/week)

When you look at the pieces does it reminds you something related with that weeks?

Is there any difference between the two pieces that you used? (Did two pieces change differently?)

What made them change differently? Do you remember any specific moment, reason or effect?

(Represent their transformation)

When you look at these two pieces, how do you feel/what do you think about these pieces?

Do they have a meaning for you? Why/ Why not?

Would you like to keep them? Why/ Why not?

Would you like to continue using these kind of accessory and collecting these materials? Why Why not?

What do you think about the duration of the study? How to change the material and starting

using the new one for the other week?