

**Challenging the Clock Time-based Deadline
Management Tools:
A Case of Procrastination Time**

by

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Challenging the Clock Time-based Deadline Management Tools: A Case of Procrastination Time

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A long long long procrastinated thesis...

ABSTRACT

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Procrastination time is a period in which traditional time management tools fail to support individuals' practices. This dissertation aims to explore how and what people define "procrastination time" when there is deadline pressure. By exploring how people contest the current definitions of deadlines while procrastinating, I add a case to the stream of time studies in HCI-design that challenge the objective and universal understanding of time. To this end, I conducted a qualitative analysis of an urban digital library's entries with the #procrastination hashtag and conducted eight follow-up interviews with self-identified procrastinators to reveal opportunities for dealing with deadlines and time pressures. The outcomes helped to revisit the design potentials for deadlines, inspired by rethinking the procrastination time in HCI. Five potential design insights are introduced to help designers to think beyond the objective and static understanding of time when designing future time management technologies in HCI. With this work, my contribution to the ongoing time studies is 1) adding a qualitative study on the positive and inspirational potentials of procrastination time for digital design and 2) providing five inspirational design insights for future time management tools to deal with deadlines and time pressure.

ÖZETÇE

Saat Ölçeğine Dayalı Teslim Tarihi Yönetim Araçlarını Yeniden Düşünmek:

Gönüllü Erteleme Zamanı Örneği

Mert Yıldız

Tasarım, Teknoloji, ve Toplum, Yüksek Lisans

1 Kasım 2022

Gönüllü Erteleme Zamanı*, geleneksel zaman yönetimi planlama araçlarının bireylere yardımcı olamadığı bir zaman periyodudur. Bu tezin amacı, son teslim tarihi baskısı olduğu zamanlarda bireylerin gönüllü erteleme zamanını nasıl tanımladıklarını araştırmaktır. Bu çalışma bireylerin gönüllü erteleme esnasında son teslim tarihi tanımını nasıl karşılarına aldıklarını inceleyerek, İnsan Bilgisayar Etkileşimi alanındaki objektif ve evrensel zaman anlayışlarına meydan okuyan zaman konulu çalışmalara tasarım odaklı bir katkı yapmaktadır. Bu amaçla, son teslim tarihi ve zaman baskısını kıracak fırsatları ortaya çıkarmak için çevrimiçi katılımcı bir sözlüğün #procrastination girdileri kalitatif bir şekilde analiz edildi ve kendini gönüllü ertelemeci olarak tanımlayan 8 bireyle röportajlar yapıldı. Çalışmanın bulguları, objektif ve statik zaman anlayışına karşı çıkan yeni teknolojilerin önünü açmak üzere ilham verme amaçlı 5 tasarım fikri ortaya çıkardı ve İnsan Bilgisayar Etkileşimi alanındaki geleceğin zaman planlama teknolojilerine nasıl katkıda bulunabileceğine dair tasarım yönleri ekledi. Bu çalışma giderek genişleyen zaman konulu çalışmalar literatürüne, 1) gönüllü erteleme zamanının anlatısını tasarım için bir ilham kaynağı olarak eklemek ve 2) geleceğin zaman planlama araçlarına tasarım fikirlerini sunarak son teslim tarihi ve zaman baskısını kırmak üzerine katkı sağlamaktadır.

**Gönüllü erteleme zamanı: "Procrastination time" teriminin bu tez kapsamında 2 farklı araştırmacının onayı ile Türkçe çevirisidir.*

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ABBREVIATIONS

HCI	Human Computer Interaction
UDM	Urban Dictionary Member
ODU	Online Urban Dictionary
IPS	Irrational Procrastination Scale



Chapter 1:

INTRODUCTION

Time is a basic part of how we make sense of human lives in our urban lives, and the definition of it takes many shapes in societies. Sometimes it is perceived as an abstract concept described by events and changes around us. In other cases, it is considered a unit that measures, tracks, and helps humans align. Time is a concept that urban social life would be hard to imagine without it. Simply imagining how we would ask “when” without the word itself illustrates how time is embedded and exists in humans’ day-to-day lives. In the past few decades, time has been studied by many different scientific fields. For the majority, time is considered an objective and static constant. A definition emerged: clock time (definition: Clock time quantifies time frames into abstract time-units, it measures, regulates, and controls temporality, it rationalizes timing, evens out time patterns, and controls time sequences (Schuller, 2006; Villegas, 2017)), the time that is displayed by the clocks and clock technologies. *“Time is the time of the clock, a mechanical instrument that can record its exact quantity, making it measurable, uniform, progressive and predictable (Starkey, 1989)”*.

From Human Computer Interaction (HCI) perspective, time has become a key concept in interactive technologies (Rapp et al., 2021). *“From issues related to mapping and visualizing data along timelines via explorations of temporality as a design material to studies of lag and the rhythms of work, time is a recurring perspective in Human-Computer Interaction (HCI) research “ (Wiberg & Stolterman, 2021). Early studies utilized clock time and gave different forms to it in the management tools. From tracking to scheduling, clock time is considered a universal and objective approach in Western Societies. Clocks and clock time dominated how humans should perceive time in their lives. As Mumford et al. and HCI researchers (Lindley, 2015; Mumford, 1937) stated, “Abstract time became the new medium of existence. Organic functions themselves were regulated by it: one ate, not upon feeling hungry, but when prompted by the clock: one slept, not when one was tired, but when the clock sanctioned it.” [p. 17]. With the hegemony of the clocks, previous studies summarized the current conceptualization of time as:*

- an abstract phenomenon that is hard to grasp and reflect on (e.g., not knowing what to expect when a clock displays a number) (Rapp et al., 2021)
- a tool for measuring precision-based coordination (e.g., being at a point in an exact time and location) (Huang & Stolterman, 2011a)
- a tool for tracking efficiency and productivity (e.g., measuring the work outcomes through how much time is spent on them) (Leshed & Sengers, 2011)

These results led to perceiving the critical actor of timekeeping practices, clocks, as external technologies that do not reflect human needs. Therefore, clock time became externalized from human practices, transforming its agency into something alienated that controls, pressures, and creates tensions among humans (Villegas, 2017).

Since time was one of the core concepts of interactive technologies, one part of this alienation was also visible in HCI research by considering the role of time as a measure of success and a tool for efficiency and productivity. Time management technologies emerged and replaced humans' natural scheduling and coordination practices. Many Western Societies positioned time management as a core driver for measuring success. As stated by (Rapp et al., 2021): “... *time in Western societies still remains anchored to objective clock time. Time is seen as viscerally connected with technology and science, offering a means both to measure phenomena and support the creation of “precise” machines.*” the objective and numerical definition of clock time dominate countless interactive technologies. Time management tools (such as digital calendars) lead to perceiving time as a matter of acceleration. Many other digital tools support being faster in time by shortening the response times (e.g., instant buttons) and speeding up the interactions (e.g., faster response rates on the screens) with the digital data.

One part of the clock time is constructed by the concept of the deadline (date or time before which something must be done: Merriam-Webster Dictionary) in time management technologies. Deadline is defined as a critical term for measuring clock time. For example, in many Western cultures, completing a task within a deadline would be considered efficient and successful. In many cases, deadlines take the form of pressure and urgency in interactive technologies (Shin & Yoon, 2021). Tools that track clock time (e.g., planners and project management software) became widely available for creating, tracking, and removing time (i.e., removing an event from Google Calendar). These technologies utilized deadlines as a term for supporting the efficiency and productivity of

humans. The Western approach to deadlines is further considered as being busy and constantly rushing to tasks, supporting acceleration and clock time. However, this approach is mainly tied to clock time, and little is known about how deadlines intersect with humans' subjective time perceptions. Therefore, understanding deadlines and their relations with subjective time is needed. Such a setting may provide new insights for designing the future of time management tools and further challenging the clock time's dominance in the design of time management technologies.

One case to push the boundaries of deadlines and their relation to subjective time is the practice of procrastination. Procrastination is a term that is defined as delaying, avoiding, postponing, or putting off specific tasks in a given time period or a deadline at work (Metin et al., 2016). Spending time in procrastination is often regarded as delaying the deadline pressure, and procrastination occurs when there is a deadline. Therefore, understanding procrastination time has the potential to broaden our perspectives on how subjective time and deadlines can meet in HCI.

1.1 HCI & Time Studies: An Overview

Challenging the clock time, recent HCI works mainly focus on slow design movement as a counter-argument for the acceleration of technology and everyday life practices (Hallnäs & Redström, 2001). Studies focus on slowing down the speed of technology and interactions with them to create a space for reflection and amplifying the utilization of clock time-based interactive technologies from silent efficiency-based tools to more extended means (Grosse-Hering et al., 2013; Strauss & Fuad-luke, 2008). They highlight the essential aspects of time and its power for building long-term relationships with domestic technologies (Odom, 2015; Odom et al., 2014). By contextualizing multiple paces in the form of slowness (slowing down the technologies for inviting self-reflection) (Odom, Wakkary, et al., 2018) and pointing to the necessity of investigating different paces, previous studies explore a deeper understanding of the temporality and rhythms in the technologies that humans interact. These discussions helped bring a new design space into focus for rethinking the pace of time from constant acceleration to, for example, slow design. The slow design movement is a significant breakthrough and is considered an early step in challenging the clock time's dominance in daily life. It took

the efficiency of time and illustrated diverse opportunities for experiencing multiple temporalities.

Recent work in HCI further explored subjective conceptualizations of time, challenging the clock time definition in different contexts by observing diverse temporal experiences, e.g., family time (Bødker & Grönvall, 2013). Investigating different cases, such as looking at festive times (Light & Petrelli, 2014), older adults' timekeeping practices (Loup et al., 2017), and non-western communities' time management practices (Taylor et al., 2017), studies revealed that the Western conceptualization of clock time does not fully reflect on the subjective timekeeping practices. The studies indicated a need to explore *“how to contest the universal and objective understanding of time.”* (Di Bartolomeo et al., 2020). Furthermore, studies that examined the role of time in specific communities like Aboriginal people, families, and older adults (Bennett et al., 2012; Loup et al., 2017; Taylor et al., 2017), revealed new alternative narratives of time that the role of time varies according to cultures, communities, and specific user groups. The overlapping approach in these studies and the HCI field often reflected the necessity for having more diverse narratives, which can further illustrate contrasting points of clock time.

In this research space, exploring procrastination and its relation to the understanding of subjective time and deadlines becomes a compelling study. This dissertation adds a narrative on how perceived subjective time (time of procrastination) meets deadlines. I am motivated to look into procrastination, as it is a unique time period when traditional time management tools fail to support procrastinators' practices (Gupta et al., 2012). I will provide the dissertation's aim and motivation in the upcoming sections and introduce the research questions.

1.2 Aim

I aim to understand how people define their procrastination experience in relation to their overall time experience, particularly when there is deadline pressure. This understanding can help discover how people's time practices can be supported in managing deadlines and the time before deadlines. With this work, I add another case to the stream of HCI literature by exploring how people challenge deadlines while spending time procrastinating. Understanding this specific time is significant for the field because

this is a time to be managed, but the relevant tools fail to aid (B. Bin Chen & Chang, 2016; Kovacs et al., 2019; Lenz et al., 2013). While digital tools focus on techniques such as dividing time, allocating time to slots and boxes on the screens, or notifying people to prevent procrastination, these tools often fail to capture the individual's subjective perceptions of time (Leshed & Sengers, 2011). They mainly dwell on the strategies on how time “should” be managed, causing mismatches between human practices and technological interventions (Hassenzahl et al., 2016). Therefore, looking into procrastination and its relation to time is valuable for challenging the clock time-based time management tools.

1.3 Motivation

As mentioned in the introduction, I aim to challenge the current understanding of clock time-based management tools by taking procrastination time as an alternative time narrative in the realm of deadlines. To elaborate on this motivation, procrastination provides a suitable case since, in procrastination time, different time orientations are in a subjective and dynamic change towards the deadlines (Ferrari & Díaz-Morales, 2007). Further, pace plays a critical role in shaping these orientations because the pace of procrastination time is unclear (Cheung & Ng, 2019). Procrastination occurs when multiple temporalities intersect, converge, and diverge before deadlines (Jackson et al., 2003). In this regard, I am motivated to understand procrastination and its relation to subjective time concerning deadlines. Contrary to previous studies in HCI that approach procrastination as a behavior to overcome (e.g., (Edwards et al., 2015a; Foulonneau et al., 2016a; Lenz et al., 2013; Valladares et al., 2016)), by exploring this subjective narrative, my focus is to understand how time is perceived while procrastinating in relation with a deadline.

Nonetheless, procrastination time becomes an appropriate study for revealing new and alternative narratives that might challenge the objective understanding of time. As stated in the introduction, “*how to contest the universal and objective understanding of time.*” (Di Bartolomeo et al., 2020)”, procrastination time holds the potential for contesting the current understanding of time in the HCI field.

1.4 Research Questions

The research question of this dissertation is:

- How can understanding procrastination time challenge objective definitions of time and pave the way for designing future time management technologies for deadlines?

This question holds two main promises: 1) Exploring procrastination time from a design and HCI perspective by understanding its components and constructions. It mainly aims to explore how procrastination time is defined and perceived, focusing on investigating this new time narrative and 2) Transferring this understanding into actionable insights for designing better future time management tools. It aims to saturate the findings into actionable themes that can be implemented in interactive technologies. To respond to my main research question, I generated the following sub-research questions to help investigate the topic. These are:

- What current studies challenge objective perceptions of time in the Human Computer Interaction field? (Exploring the current literature)
- How can understanding procrastination and its relation to time, deadlines, and time pressure, support challenging these objective perceptions? (Exploring the study)
- What insights can be derived by understanding procrastination time, and how can these insights assist in designing future time management tools? (Generating insights)

1.5 Research Methods

As procrastination is a behavior in that multiple temporalities intersect, converge, and diverge before deadlines (Jackson et al., 2003), defining the time experienced in procrastination is a complex topic. It is not often clear how procrastination begins, interacts with other periods such as work or leisure time, and how procrastination ends. Procrastination is an everyday life behavior that can emerge in almost every context. Regarding deadlines, different time orientations are subjective and dynamic changes (Ferrari & Díaz-Morales, 2007). Procrastination is usually considered a blurry behavior that emerges within such change.

To answer this dissertation's research question, I first investigated how people share their definitions of procrastination time on a public website. I tried to pinpoint from the narratives which mediums or tools they utilize to express what is happening while they procrastinate. This led me to explore one of Turkey's most significant data sources: An Online Urban Dictionary. In this context, I conducted a thematic analysis study on the #procrastination entries by analyzing -717 items- in a well-known online local urban dictionary in Turkey.

I decided to explore how procrastination is lived, expressed, and utilized in a context where I can further explore the findings of the Online Urban Dictionary analysis. To this end, I decided to interview self-identified procrastinators to observe their procrastination time-related practices and how procrastination time intersects with clock time. In the methods section, I explain each study in detail.

1.6 Contributions

In my dissertation, the contributions are twofold. First, the findings describe how procrastination time and deadlines are interwoven with each other by illustrating how time is expressed while procrastinating and pointing to the importance of “changes in time perceptions before deadlines.” This dissertation adds another new discussion space for the existing HCI studies that centralizes time. This dissertation highlights the importance of investigating procrastination time from the design and HCI perspectives. In brief, in procrastination, time transforms into an abstract concept and gets externalized by individuals’ daily life practices. Procrastinating time becomes an alternative narrative for challenging the linear perception of time. In procrastination time, the flow of time is defined through materiality around the individuals.

Second, I generate five inspirational design insights for Human Computer Interaction (HCI) for redesigning time management and tracking technologies where procrastination-like subjectivities can meet deadlines with less conflict. I give actionable insights for interactive tools to move beyond their statical structures of clocks, numbers, and points in the calendars to consider more subjective and dynamic concepts.

These insights are:

- Design Insight 1: Use Different Forms of Paces to Create a Sense of Ongoingness while Deadlines are Approaching
- Design Insight 2: Use Everyday Life Materials as an Inspiration for Making Deadlines more Tangible
- Design Insight 3: Stretch the Given Time to support solving Conflicting and Mismatching Deadlines
- Design Insight 4: Prioritize Organic Time Transitions in Management Applications over Slot-based Approach
- Design Insight 5: Utilize Procrastination Time for Reducing Mental Pressure caused by Work-related Time

In the following chapters, I will explain the studies that bring me these five inspirational insights. I will start by giving an overview of the current studies on time in HCI, followed by the methods and findings of the studies. Finally, I will discuss the findings with the literature and explain the connection of the above-mentioned design insights to the literature and the findings.

Chapter 2:

BACKGROUND

The background section of the dissertation begins by describing universal and objective time, borrowing from related theoretical concepts that help design in digital contexts. I move on to the HCI studies that challenge the universal and objective understanding of time by introducing new narratives that challenge normative time management tools and new representations for perceiving time differently. Then, I discuss the conceptualization of slow design as one of the critical dimensions in HCI. Finally, I explain procrastination and its relation to time, especially to deadlines

2.1 *Objectivity and Universalism of Time*

When speaking about time, it is often hard to describe what ‘time’ actually stands for in humans’ lives. In many societies, time is utilized as a universal measure that allows humans to coordinate (Offit, 2014). Dates, months, numbers, and clock hours-minute hours stand as concepts to define an objective time. As stated in Lewis Mumford’s book: *“The clock, moreover, is a piece of power-machinery whose ‘product’ is seconds and*

minutes: by its essential nature, it dissociated time from human events and helped create the belief in an independent world of mathematically measurable sequences. (p.15)” He criticized the abstraction of time by arguing that time became a discrete concept from the natural organization of human bodies and the artificial world (the world that is created by industrialization) around them (Mumford, 1934); and further illustrated how time transforms into a tool for pointing a direction to be reached or achieved through precise structures. A detailed review is also mentioned in Adrian Bardon’s *A Brief Review History of the Philosophy of Time Book* (Bardon, 2013). It stated that clocks and numbers define abstract time and are perceived as a universal coping mechanism for solving problems: *“Take the case of numbers. Is the number seven, for example, itself a real thing? Obviously, it is not a material item like a rock or tree or sloth. But we talk about it and solve problems with it (p.5).”* The universal conceptualization of clocks and timekeeping technologies led many societies to perceive time as unnatural, non-biological, and a phenomenon that is disconnected from the materiality around humans (Bardon, 2013).

Recent HCI studies illustrated the importance of diverse narratives on time can expand the perception of time from being abstract, numeric, precise, and objective to more essential and subjective traits (Odom, Lindley, et al., 2018; Pschetz & Bastian, 2018; Rapp et al., 2021). With the technological advancements, the singular perception of time got split into several structures, such as digital time, which is utilized by the digital routines in schedules & calendars (Lindley, 2015), and plastic time (Irani et al., 2010; Rattenbury et al., 2008), which is often defined as neither leisure nor work-related periods. These studies show that plastic time is considered unanticipated, self-reflexive, and fluid. In other saying, the empty time spaces in busyness create this concept with the growing interest in accelerated living with technologies such as immediate notification, the notion of being online all the time, and so on. (Rattenbury et al., 2008).

The recent work further articulated time as a socially and culturally constructed perception that is entangled in many forms in people’s lives (Bidwell & Elsdon, 2021; Taylor et al., 2017; Timur, 2006; Yildiz & Coşkun, 2020). Taylor et al. criticize how deadline-based approaches to time in Western Societies fail to address humans’ tangible and intangible aspects in constructing moments. The studies explore the Aboriginal families and argue that time is shaped by tangible (e.g., people) and intangible (e.g., energy) traits which together make up the “right time” for doing scheduled and calendar-

based work (Taylor et al., 2017). Building upon that, the “right time” approaches the notion of time by explaining “when situations” and which things should occur or not in the circumstances with a sense of social, cultural, and relational aspects of the routines and activities. It challenges Western time management practices (completing milestones in the calendars by the given deadlines) through an alternative calendar design. Still, the critical aspect is understanding people's routines and how time plays a role in organizing work and life with calendars and scheduling and with the “right” activities (Yildiz & Coşkun, 2020) that need to be done at appropriate periods. This approach challenges the objective time understanding by adding the narrative of Aboriginal Communities’ time practices and further provides insight into the redesign of time management tools with a lens of the “right moment.” While the social side of time is studied to discover problematic parts of the existing time perceptions, diverse approaches to inquiring about time are also stated (Light & Petrelli, 2014; Pschetz, 2015; Pschetz & Bastian, 2018). Pschetz et al. conducted a series of studies with kids and families to address that time can be experienced in relations between cultural, social, and political forces. The studies discuss time as a subjective phenomenon by drawing attention to time as a pace (slow-fast) and time as direction (past-present-future). Moving between multiple rhythms and complex human relations (material, cultural, social, political, and economic forces), the study contributes to temporal rhythms and paces by widening our understanding from slow and fast to multiple tempos that enable time to be uncovered in the future. Looking at the time as something that emerges from the complex relations between cultural, social, economic, and political forces (Lindley, 2015), Lindley argues the collective aspects of time in the Western world. The study discusses how people are getting detached from the collective, not necessarily meaning spending time together, but poor connections in practices in people’s lives. Approaching time in a collective sense uncovers the multiple, intersecting temporalities in everyday human life and suggests a connection for experiencing time better. Further, this concept offers a contrasting case between Western and Non-western time practices that challenge the objective time, particularly in Western Societies, by looking at the intersections of complex social rhythms.

Previous studies in time and HCI expanded the former abstract, numeric, precise, and objective understanding of time to a more nuanced subjective definition by introducing perspectives from kids, families, Aboriginal people, and older adults, focusing on diverse communities in Western or Eastern cultures. The diversity was visible both for

implications such as the introduction and discussion of concepts like collective time (Lindley, 2015), family time (Bennett et al., 2012; Kavas et al., 2021) and as new suggestions for pace (Odom, Wakkary, Hol, Naus, Verburg, Amram, & Yo Sue Chen, 2019), managing time, or rethinking calendars (K. R. Lee et al., 2020). These new perspectives created novel ways to challenge our current understanding of time and human relations to time-related technologies (such as clocks) that challenge efficiency and productivity as critical aspects.

2.2 *Representations and Management of Time in HCI*

HCI researchers focus on designing interactive systems that support efficiency and productivity (Shin & Yoon, 2021). Time is anchored to productivity and efficiency concepts in HCI. These concepts dominate the Western approach to time. For example, *TimeAware* is a self-monitoring system for capturing and reflecting on personal productivity at work. The system visualizes computer usage time to raise awareness and promote self-productivity (Kim et al., 2016). Another example is *meTime*, an application that shows users' time allocations for different tasks. It aims to visualize how much time is spent on distracting tasks to improve focus (Whittaker et al., 2016). *The Time Machine* visualizes task management and multitasking through an ambient physical object to trigger self-reflection on personal productivity (Ahmed et al., 2014). *GoldenTime* is a mobile app that promotes timeboxing to regulate smartphone usage through self-tracking time (Park et al., 2021). Most of the HCI works on time focused on improving personal productivity, task efficiency, and promoting efficient work use. Although this approach led to perceiving time as one of the critical concepts in interactive systems, it also downgraded its meaning to a tool for measuring success. However, several design works criticized this approach. They emphasized that time is deeply bound to human practices and that time cannot be merely considered a success unit but has a complex nature. As stated by Sengers et al., “*While American users of productivity tools have internalized cultural norms of busyness, engagement with productivity tools is not simply an attempt to optimally organize one's schedule and activities, but also includes significant social and emotional dimensions*” time is not a simple unit of measuring business (Leshed & Sengers, 2011). However, it has emotional and social constructions too.

Recently, research showed that time could be perceived as a design material in interactive objects (Odom et al., 2018; Odom & Duel, 2018) and not the only means for measuring productivity and efficiency. It is no surprise that when we speak about time research, “designing a new clock” becomes one of the central outcomes. It is also often visible that HCI research on time and temporality comes up with designing interactive clocks that uncover hierarchies, intersections, and problematic parts between time-related technologies (e.g., such as management tools (Lund & Wiese, 2021), calendars (Buzzo & Merendino, 2015)) and human practices (Pschetz & Bastian, 2018). Looking at the clocks, how they are designed and utilized, and their meanings, one of the main emphases was visualizing them in alternative ways for testing various hypotheses. For example, the *Reverse Alarm Clock* (Figure 1) is a concept that aims to explore “designing for the self” (Ozenc et al., 2007). It visualizes bedtime rituals with kids and their parents and shares design insights for designing for the self.



Figure 1: Reverse Alarm Clock Bedside Companion for the kids (on the left) and parents2 display board (on the right)

LUNE (Figure 2, on the left) is a wall-mounted clock that visualizes the moon's cycles to engage with time more naturally (S. ho Lee et al., 2019). *DayClo* (Figure 2, on the right) is an interactive tabletop clock that connects to calendars and visualizes calendar data for promoting self-reflection in the office environment. Rather than displaying numbers and hour-minute clocks, the object displays upcoming events in the calendars in an implicit way (K. R. Lee et al., 2020).

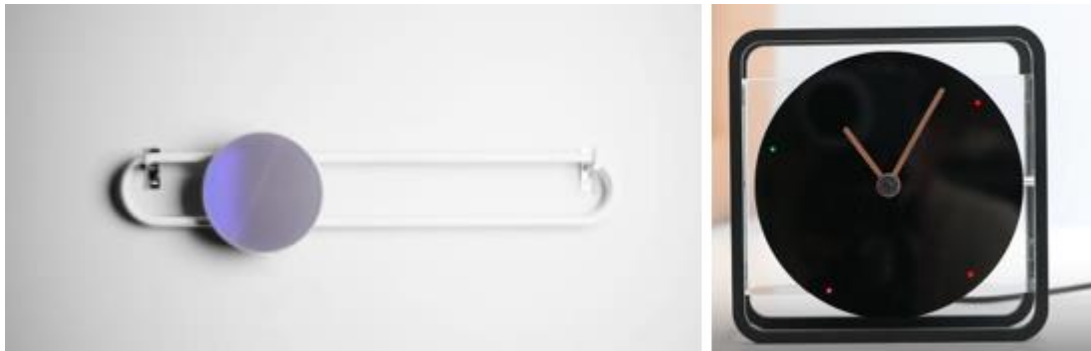


Figure 2: LUNE (on the left), moving between left and right and changing the display color of the disk according to day and night cycles. DayClo (on the right) displays calendar items with dots and makes it visible when the user touches the top part of the table-top object

Experience Clock and *Disappearing Clock* are design speculations that challenge the numerical representations of time (Yildiz & Coşkun, 2020). *Takt* is a wearable clock-like piece that explores how kids with ADHD perceive duration and time through touch and visual feedback (Eriksson, S., Gustafsson, F., Larsson, G., & Hansen, 2017).



Figure 3: From left to right: Disappearing Clock, Experience Clock, and Takt, visualizing different aspects of time rather than illustrating numbers and clocks

Family Clock is a tabletop clock that displays the length of a day (rather than numbers) to explore tensions, hierarchies, and interwoven temporal relations between family members (Pschetz & Bastian, 2018). *Printer Clock* is a grandfather-like shaped clock that expresses ‘temporal empathy’ in 4th-grade students. It reveals the multiplicity of the rhythms by printing out the events in a specific time in the past.



Figure 4: Family Clock (on the left) and Printer Clock (on the right)

The example studies reflect how clocks became a tool for research when combined with a research hypothesis and technology (e.g., making a clock interactive). The clock itself is a piece of domestic technology that embodies different aspects of time. It needs additional design space to rethink its purpose from being a by-product of the research. The research thread in the latest review on Time & HCI, “*‘time’ has shifted from serving as a secondary or implicit dimension or aspect to more clearly denote a particular strand of research in HCI where ‘time’ is a core fundamental and even primary concept*” (Wiberg & Stolterman, 2021) illustrated that time is becoming a central topic in HCI. These studies highlighted how time could be studied from a design perspective by changing what is displayed on a clock’s surface and revealing critical discussions around Western approaches to time.

2.3 *Slow Design Movement*

The HCI studies on temporality opened a new space, revealing topics in slowness and slow technology for future design practices and inspiring the future of interactive systems (Odom et al., 2021). The expansion of multiple rhythms of time proposed by (Huang & Stolterman, 2012; Lindley, 2015; Odom, Lindley, et al., 2018; Sharma, 2009; Thomas et al., 2013; Tsaknaki et al., 2016; Vallgård et al., 2015) discovered that time is not necessarily in a universal steady tempo. However, the different paces reveal new dimensions for developing novel technologies. In that sense, slowness emerged as a notion that subjective speed of time is possible among humans. Slowness became one of the central topics of HCI studies for discovering temporality and further utilizing it as a resource for design research.

The studies developed new artifacts to explore slowness in everyday life practices (e.g., music listening or photo streaming). Beginning with the studies on Slow Technology (Grosse-Hering et al., 2013; Hallnäs & Redström, 2001; Strauss & Fuad-luke, 2008), which argues that taking reflective moments in accelerated lifestyles, the studies contributed to the conceptualization of slow pace as a counter-argument for the objective pace of time. For example, *Olly* (a music listening device for experiencing memories with temporal interactions) and *SlowGame* (a snake game that can only be played over some delays) use slowness as a framework for exploring long-term experiences with everyday computational objects (Odom, Bertran, et al., 2019; Odom, Wakkary, et al., 2018; Odom, Wakkary, Hol, Naus, Verburg, Amram, & Yo Sue Chen, 2019). *OLO Radio* explores reflecting on the music listening experience with a modified radio-shaped object and utilizing slow interaction (Odom & Duel, 2018). *Chronoscope*, a tangible near-eye object, invites the user for a slow photo streaming experience with the past photos (A. Y. S. Chen et al., 2019).

These studies discuss temporality (particularly slow pace) as a potential design dimension when researching new timely interactions and experiences with objects (Huang & Stolterman, 2011). They advance the field with the theorization of slowness and how slow technology can support more diverse fields in the HCI (Odom et al., 2021; Rapp et al., 2021; Zhong et al., 2020). Although HCI research offers a rich collection of studies on slowness and slow interactions for challenging the mainstream approach to temporality in HCI, there is not enough emphasis given to discovering alternatives more aligned to everyday practices humans face in their daily-life settings.

2.4 Procrastination and Time

Procrastination is a term that is defined as delaying, avoiding, postponing, or putting off specific tasks in a given time period or a deadline at work (Metin et al., 2016). Procrastination is often regarded as sub-optimal behavior that undermines workers' productivity (Nguyen et al., 2013). It is regarded as a habit or personality trait that negatively affects workers' time management skills, in the long term, by blocking their ability to fulfill short-term goals (Jackson et al., 2003; Schödl et al., 2018). It is stated that procrastination affects mental health negatively by increasing the lack of self-motivation and self-esteem. The wide variety of psychology literature argues that procrastination

originates from self-esteem and self-regulatory failures (Rozental & Carlbring, 2014). Over the past years, many studies approached procrastination from different perspectives, a crucial topic that psychology has long studied. While some studies consider procrastination a behavioral problem, others consider its interactions with mood, emotions, goal-setting, and self-esteem failures (Klingsieck, 2013). As reviewed by Carlbring et al., foundational psychology literature defined procrastination from different angles, such as:

- distress (procrastination is a delay in conjunction with subjective discomfort) (Solomon & Rothblum, 1984)
- postponement (when we delay beginning or completing an intended course of action) (Blunt & Pychyl, 1998)
- irrationality (the illogical delay of behavior)

In the psychology literature, procrastination and time relationship is heavily intersected with each other. It is argued that in most cases, procrastination is a behavior that occurs due to a lack of time management skills and failing deadline requirements. As stated by (Ferrari & Díaz-Morales, 2007): *“Although shown to be associated with affective, behavioral, and cognitive characteristics reflecting more than inefficient time management (Ferrari et al., 1995, Ferrari and Pychyl, 2000), the concept of procrastination remains closely related to meeting deadlines within a specific timeframe.”* The time spent on procrastination is usually considered as “unproductive” and “inefficient” resulting in missing key deadlines in daily life and work life (Metin et al., 2016). Studies explored how spending time in procrastination negatively affects individuals’ time perceptions, such as losing track of time, preventing long-term planning skills, and being unable to value the present moment (Cheung & Ng, 2019).

The short overview above illustrates the heavily deficits-oriented view on procrastination, where it is mainly argued that procrastination is a behavioral problem that negatively impacts individuals’ time experiences. Only a few studies focused on taking procrastination behavior as a case for designing interventions. Their approach was either to prevent procrastination and/or to minimize the time spent on procrastination. In the next section, I will give an overview of the HCI and design studies focusing on reducing procrastination in different contexts. I will start explaining exemplary work and conclude the section with common strategies for designing for procrastination time.

2.5 Procrastination, Time, and Design

Procrastination, time, and design relationship are mainly studied by taking procrastination as a habit or behavior to overcome. Early design studies focused “stuckness” aspect of procrastination (Sachs, 1999). The study emphasized that procrastination is a form of being stuck in time and duties, and there might be ways of overcoming it to manage time better. From here, recent studies took the increase of digital technologies and the effects of social media use as roots that cause time management failures in procrastination. Sun & Kim, (2022) highlighted that task-complexity and online environments are essential aspects that trigger procrastination in students’ procrastination and result in lousy time management practices. The study suggests that less complex tasks and face-to-face interactions might help decrease procrastination in learning environments (Sun & Kim, 2022). Similarly, Rodriguez et al. designed a socio-technical artifact to reduce procrastination in an academic environment. The artifact acts as a chatbot and nudges participants to reduce procrastination (Rodriguez et al., 2019). The Pomodoro technique is another approach that has been widely used for overcoming time-related problems and is a strategy for overcoming procrastination (Cirillo, 2006). Pomodoro is a time management technique that splits big deadlines into small time pieces and adds mini breaks between each time piece. Almalki et al. utilized this technique and designed an interactive tool that functions in the Pomodoro method. The tool aims to prevent procrastination and reduce due date time stress among graduate students (Almalki et al., 2020). From another perspective, Alblwi et al. discuss that commonly known gamification techniques can be applied to Social Network Sites to regulate time spent in procrastination. Their multi-method approach summarizes that people’s expectations of anti-procrastination tools are diverse. The study touches upon these expectations, from gamifying the tasks to making people more aware of their procrastination behavior (Alblwi et al., 2019). While these studies focus on individual characteristics of procrastination, Hsueh et al. argue social and team aspects for coping with procrastination. In their study, the authors suggest several design implications for future mobile technologies and reflect on how a larger group size and interactions with other peers might be adequate to reduce procrastination (Hsueh et al., 2020).

In other studies, it is possible to see product design approaches for investigating procrastination. For example, *ReMind* is a calendar-like to-do list object that aims to help

family members handle everyday duties (Lenz et al., 2013). The tokens help family members coordinate daily life tasks and suggest better ways of managing family time. *sonAmi* is another tangible object that promotes productive procrastination. Looking at procrastination from an alternative perspective, the study suggests that time spent in procrastination can be designed to be more productive (Belakova & Mackay, 2021).



Figure 5: ReMind, one of the only examples of work in HCI that focuses on procrastination and time relationship.

Tuition is an online platform where IT community members share their progress to avoid procrastination on side projects (Lu et al., 2015). *MeTime* is a software application that informs users' time consumption to improve focus time and aims to prevent waste time on non-work related activities (Whittaker et al., 2016). Valladares et al. discuss using bet-placing to overcome procrastination via an online application where self-proclaimed procrastinators bet on different tasks to accomplish goals (Valladares et al., 2016). Similarly, the latest research utilizes chatbots and goal-setting strategies to prevent procrastination through alerts, advice, automatic rescheduling, and motivational messages (Hsueh et al., 2020; Pereira & Díaz, 2022).

These studies pinned procrastination time to be avoided, managed, or coped with. They suggested preventing it through self-reflection and better time management skills (Edwards et al., 2015; Lenz et al., 2013). The common approach in these studies focused on designing an intervention technique and measuring its impact on the procrastination level (e.g., (Whittaker et al., 2016)). The interventions varied from interactive objects to app. interfaces that track time. The interventions further borrowed commonly known daily life practices such as "betting," "goal setting," and "gamifying" the procrastination experience (Alblwi et al., 2019; Hsueh et al., 2020). The implications of design and HCI were mainly focused on better managing time by cutting big and complex tasks into smaller and shorter pieces (Foulonneau et al., 2016). Furthermore, the outcomes of these

studies varied from practical implications to designing future time management technologies to theoretical contributions to behavior change technologies.

To summarize, procrastination is mainly perceived as a harmful habit that needs to be prevented. Most studies take procrastination in the context of education and social media and observe its effects (Edwards et al., 2015). Target user groups are usually selected as students or educators, and research suggests design solutions to avoid procrastination (Lund & Wiese, 2021). Although procrastination is a popular topic in the HCI field, it is either studied from a technical perspective (e.g., measuring performance outcomes) or considered a habit to be solved with different intervention techniques. In this dissertation, my core focus is understanding the potential roles procrastination can play in understanding individuals' subjective perceptions of time and the relation of the perception to deadlines. In the next chapter, I provide a detailed research process along with the methods and my approach to my research questions.

Chapter 3:

METHODOLOGY

The main research question that holds all the qualitative studies in this dissertation together is: “How can **understanding procrastination time** challenge objective definitions of time and pave the way for **designing future time** management technologies for deadlines?” This research question holds two main research aspects (as highlighted in bold text) to explore:

- 1) understanding of the procrastination time
- 2) transferring this understanding into design practice.

Understanding procrastination time requires in-depth thoughts from the participants. As also mentioned in the background chapter, conducting research and reflecting on time is a challenging topic for many HCI researchers. Previous work reflected this issue and highlighted the importance of multi-method combined qualitative research approaches. Most of the studies on time research investigated understanding the phenomenon (e.g., the concept of the right moment in Aboriginal communities (Taylor et al., 2017)), exploring the phenomenon through different methodological approaches (e.g., ethnographic studies), transferring the learnings to implications through design (e.g.,

design implications or design artifacts), and evaluating the design outcome through diverse evaluative approaches (e.g., user enactments, field deployment of the artifacts). Adding upon the prior work on time & HCI research, I followed similar methodology steps to answer my research question. I conducted two qualitative studies to understand procrastination and time relationships better. I followed a design research approach to discover and transfer learnings into practical insights. I will give details of my research and analysis methods in the following sections.

3.1 *Research Method*

To answer my research question, I followed a **design understanding study** by using semi-structured **qualitative studies** in alignment with the use of qualitative studies in HCI research. This research method has been widely used in prior academic work and has been discussed as a resourceful way of exploring new time narratives. To this end, I conducted two qualitative studies similar to previous work. I first investigated how procrastination and its relation to time are defined and expressed in digital platforms. In the following sections, I will provide detailed information about the dictionary's description, the structure of the entries, and the data analysis process, based on **thematic analysis** (Braun & Clarke, 2006). In the second study, I conducted eight interviews with individuals who share a similar profile with the Online Urban Dictionary (OUD) authors. This helped me to contextualize the findings from the first study and get a chance to gain deeper insights into how procrastination time is experienced. To this end, I aimed to reach young adults aged between 20 and 35 with overlapping procrastination aspects with the OUD authors. In the following parts, I will give detailed explanations of the methodology.

3.2 *Discovering Online Urban Dictionary*

The study's first phase is situating a source for understanding the topic. I started my research in mediums and potential sources where people write about and discuss procrastination. In my process, I narrowed my focus to my research context, a context in which I can follow up with interviews or similar (e.g., excluding famous sources such as Reddit with a majority of users from the US). I aimed to reach sources that are open to everyone and culturally fit. My search directed me toward the most extensive online urban

dictionary (OUD) in Turkey: Ekşisözlük (eksisozluk.com). This dictionary [eksisozluk.com] is actively used and cited in Turkey, e.g., on the news, TV, and social media, to form culturally enriched definitions, offering definitions for concepts based on people's subjective experiences rather than normative definitions. It is a venue for sharing contextual meaning and opinions on different topics and events. It is essential to mention that I selected analyzing this online urban dictionary as one of the cores of my dissertation because this dictionary provides a unique medium for 1) allowing members to follow the previous thread on the same topic, provoking them to write unique entries, 2) creating an archive of entries that can be visited over time and see the evolution of the topic, and 3) allowing members to quote from previous entries, leading to a digital medium for anonymized free discussion.

In Ekşisözlük, I started searching for several Turkish translations of procrastination. These were: “#öteleme” (“postpone”), “#erteleme” (“to delay”), and “#geciktirmek” (“to stall”). All these threads contained less than ten entries, and their shared approach directed the discussion to the “#procrastination” thread (see Figure 6). There was one primary thread that contained more than 100 entries called: “#erteleme hastalığı” (“delaying sickness”). After checking several pages of entries, I decided not to continue with this thread because the authors already biased it by framing procrastination as a sickness. Therefore, I moved my search to #procrastination and discovered the main thread in the Online Urban Dictionary. There were more than 700 entries posted, and the discussion was live all the time. From all the entries under #procrastination, 25 members posted at least twice in different time periods. There are 37 entries posted in 2021, meaning that this #procrastination is an active thread and will be revisited over time.

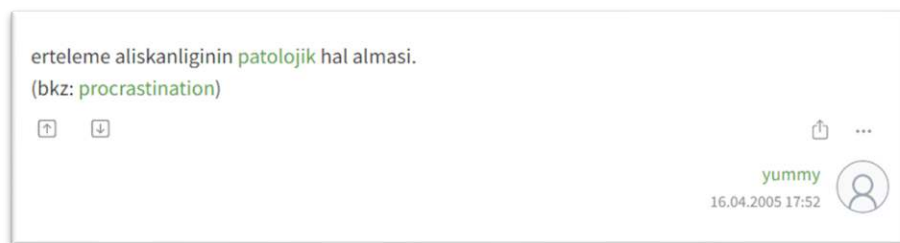


Figure 6: A screenshot of a typical entry that forwards the discussion to the "procrastination" thread (Green colored texts are internal links in the dictionary)

3.3 *The Structure of the Dictionary*

Ekşisözlük, [www. \[eksisozluk\].com](http://www.eksisozluk.com) (started in 1999) is the oldest of the urban dictionaries in Turkey, and it consists of entries around things, people, and current or past events. The urban dictionary is well-known and even respected for its influence on shaping the social understanding of things in Turkey among the younger population. It is a digital medium that allows sharing and criticizing up-to-date discussions through entries, external links, and in-site navigations (through a ‘see: ...’ caption) as a means for constructing a social meaning around a topic. Everyone can create an account and write entries. To become a member eligible to write entries, one needs to finalize multiple entries checked by other members (intern phase). After that, a nickname is approved by the high-ranked members, and the interns become verified members capable of writing entries and creating new threads. A thread is seldom concluded and is usually open for new entries (e.g., the #procrastination thread started in 2002 and is still ongoing). The members and responsible anonymous executives maintain and organize the online community. From general statistics, most dictionary members are suggested to be between 20-35 years old by 2021. In this context, I analyzed the most crowded and active thread’s entries called #procrastination with an aim to understand how time is exemplified, perceived, and embedded in procrastination activities. In total, 717 entries were posted (and still getting posted) in total. To illustrate this hashtag’s density with time and deadline relationship, several words were repeatedly used. For example, “work” (n=292), “after” (n=150), “compulsory” (n=99), and “time” (n=71) were the most used words, and they were followed by more time-related words such as “day,” “hour,” and “now.” The dictionary rules already anonymized the members. The entries’ dates ranged from 2002 to 2021. An entry could be one word, a link, or a narrative text of some pages. A typical entry was a few paragraphs, usually starting with the personal stance on the issue and introducing some experiences around the topic.

3.4 *Data Analysis Process: Online Urban Dictionary*

For the data analysis, I used thematic analysis procedures based on (Braun & Clarke, 2006) with minor adaptations for transferring the results to design work. I started by extracting the entries from the online platform. I printed out all the entries (see Figure 7, left) and selected a %30 sample of all the entries from first, middle, and last (Figure 7,

right). In order to cross-check the validity of the codes in the further steps of the analysis, another %30 of the overall entries were shared with another senior researcher. All the entries were extracted from the dictionary for creating an analysis dataset. I carefully eliminated the irrelevant entries (the irrelevant content such as shared broken links and empty posts, excluding the shared duplicate entry twice).



Figure 7: On the left, all the entries are printed out, and initial coding is done. On the right, a screenshot example of the %30 sample from the entries

The analysis process started with the familiarization step. I started reading the selected sample and generated 14 initial codes (Figure 8, left). Using these initial codes, I coded the selected %30 percent through an inductive thematic analysis (Braun & Clarke, 2006).

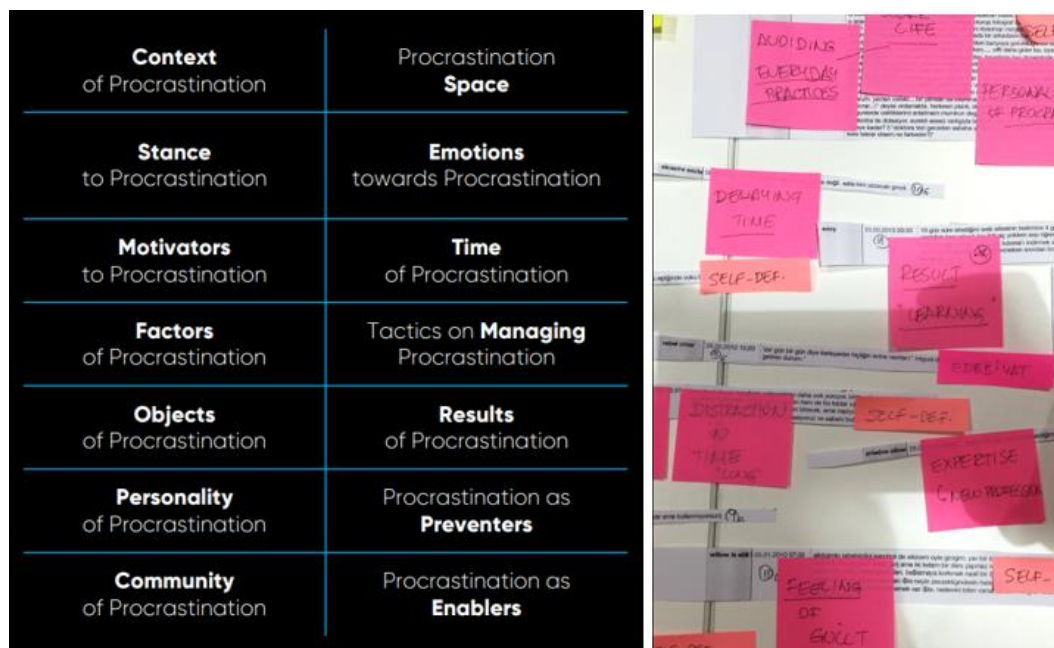


Figure 8: A screenshot of initial codes that emerged from the first round of coding

Some entries contained 1 code (Table 1, example 1), and others contained multiple codes (Table 1, example 2). At this step, each code contained a one-sentence description. For example, Procrastination as enablers code was explained as: *Spending time in procrastination enables certain aspects*. Due to the writing style of the OUD authors, most of the entries consisted of multiple codes. After a round of coding with the selected sample, I shared the initial code index with the senior researcher and asked to analyze another random %30 of the data (around 200+ entries). After this process was completed, the senior researcher and I cross-checked the validity of the initial codes. In this checking process, we aimed to extract patterns and construct tentative hypotheses for the codes that might lead us to the themes in the following steps. Some codes did not fully match with the data, and/or two coders coded them differently. Those mismatching codes were eliminated for the second round, while their content was added into the closest relevant category upon negotiation between two coders.

Table 1: Sharing examples from the initial coding process. The left column shows the example number. The Middle column shows the entry with highlighted part. The right column shows the mapping of the initial codes to the entries

Example 1	It steals my years and I easily disguise myself. It is a bad trait that is within me for many years. It is dominant in the genes, stealthily sticks the personality and never goes away for a lifetime. (Entry 148)	Personality of Procrastination
Example 2	From checking the overall entries, when I look at what has been written, it [#procrastination] is the title that pushes me to generalization. In general, when this situation is considered, rather than focusing on the type of work, it draws attention that these works always need to be done alone (See: moments when loneliness is understood.) Of course, however, these works usually seem to be related to writing/reporting, happening in front of a screen or desktop, and requiring a delivery date (See: deadline), which can most likely be done by staying at home. (Entry 102)	Definition of Procrastination Time of Procrastination Context of Procrastination Procrastination Space

I continued analyzing the entries based on the revised codes in the next round. In this step, again, the senior researcher and I checked the validity and mapping of the codes until a consensus was reached. In this step, I aimed to look at **procrastination from a time perspective, its intersection with deadlines, and perspectives** such as how much time passed and how much time is left to complete a task or work. I worked on the entries line-by-line to understand how procrastination time is expressed and perceived by the OUD authors (see Figure 9). I paid careful attention to how entries described procrastination and time relationship. After this step, codes were saturated into initial themes. For example: “Preventer aspects of procrastination” and “Enabler aspects of Procrastination” were saturated into the theme of “Utilization of Procrastination Time,” explaining how procrastination is utilized in everyday life.

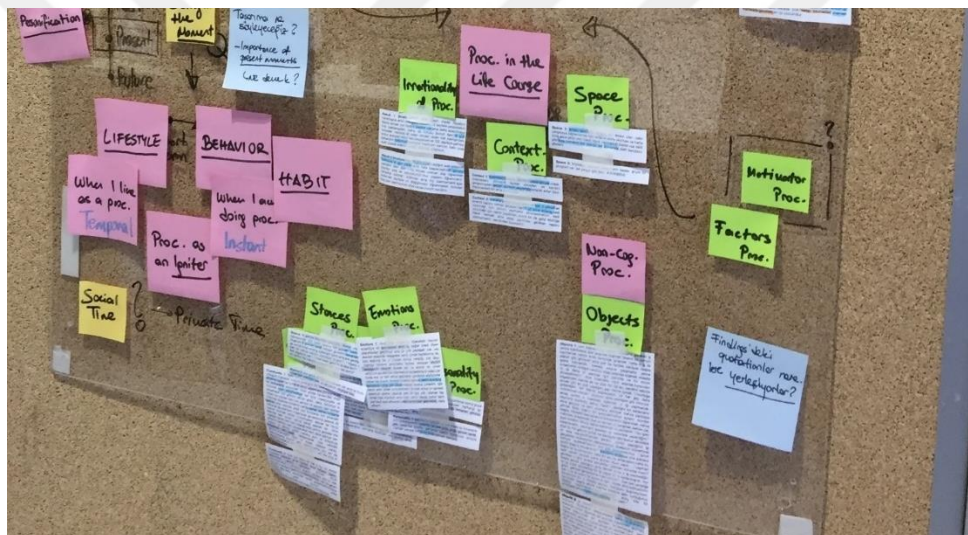


Figure 9: A screenshot of entries, how they are intersected with procrastination and time (blue highlights) with examples of initial themes

After three rounds of coding and checking the themes multiple times, we concluded with five key themes under the procrastination time and deadline relationship. These are 1) defining procrastination time and deadline relationship, 2) managing time at the intersection of clock time and deadlines, 3) utilizing fiction to communicate with procrastination time and deadlines, 4) dealing with deadlines through tangible motivations, and 5) redefining the flow in a given time. These final themes were saturated through an iterative process. For example, Procrastination as Enabler, Procrastination as Preventer, and Procrastination as Skill codes were merged under Procrastination as Utilizer Theme. ‘Tactics on Managing Procrastination’ and ‘Time of Procrastination’ were thematized as ‘management of Procrastination.’ On a later iteration, we agreed that

‘Utilization of Procrastination’ and ‘Time of Procrastination’ belong to a bigger theme of ‘Managing Time at the Intersection of Clock Time and Deadlines’ (See Table 2 for the example). A similar process was replicated each time and further continued iteratively until mutual agreement was achieved.

Table 2: An example of reaching the final themes from codes in the online urban dictionary analysis

Codes	Initial Themes	Finalized Theme
Procrastination as Enabler	Procrastination as Utilizer for Time	Managing Time at the Intersection of Clock Time and Deadlines
Procrastination as Preventer		
Procrastination as Skill		
Tactics on Managing Procrastination	Management of Procrastination Time	
Time of Procrastination		

3.5 Interviews with Self-Identified Procrastinators

After understanding procrastination and time relationship, in the second study, I conducted semi-structured interviews with eight self-identified procrastinators to open up the discussion on work time, procrastination time, and leisure time. During the interviews, I asked questions in 3 main groups: Understanding procrastination practices about work and leisure, unpacking procrastination time in their work and leisure time, and intersections of procrastination time, work time, and leisure time. Throughout the interviews, I gathered detailed information on how procrastination time is utilized by work-related time, how various perceptions affect self-identified procrastinators’ work-related time and measures of work time, and lastly, detailed information on managing procrastination-work and leisure time.

3.6 Recruiting Participants

To reach out to potential participants, I prepared a short online survey. This survey asked participants to fill; out 1) a digital ethical consent form, 2) demographic information (name, age, work type, and contact information), 3) the Irrational Procrastination Scale, a commonly used scale to determine a person's level of procrastination (Svartdal et al., 2016), and 4) a final question of how they would define procrastination. I reached out to the participants by sharing the flyers via social media accounts (not only authors' social media accounts but various online groups were considered, too) and networks. After three weeks, I gathered 36 responses. From this, I selected 8 participants based on their Irrational Procrastination Scale scores (participants who obtained a score of 24 and above out of 50 are considered procrastinators). I used Irrational Procrastination Scale to determine whether the selected participant is perceived as a procrastinator. The detailed demographic information of the participants can be found in Table 3.

Table 3: Interview participants and their demographic information: Name, Age, Profession, Weekly Work Hours, Work Time Type, Irrational Procrastination Scale

Name	Age	Profession	Weekly Work Hours	Work Time Type	Irrational Procrastination Score
P1	34	Electrics and Electronics Engineer Project Manager	42.5 hours	Flexible to a certain extent (expected to attend meetings)	32
P2	26	Business Development Specialist	50-57 hours	Regular shift (9:00 to 18:00)	27
P3	26	Interior Architect	42.5 hours	Regular Shift (8:30 to 18:30)	36
P4	26	Sociologist	Flexible-no quota	1-2 days at the office Rest of the days: home office	26
P5	25	Computer Engineer	45 hours	Flexible to a certain extent (expected to be working between 10:00-17:00)	36

Name	Age	Profession	Weekly Work Hours	Work Time Type	Irrational Procrastination Score
P6	28	Game Designer	Depending on the deadline. It can go until 60 hours	Home office with flexible hours	43
P7	28	Electronics Engineer	45 hours	Flexible as long as the quota is filled	35
P8	30	Freelancer	42.5 hours	Flexible	30

3.7 Data Analysis Process: Self-identified Procrastinators

Each interview lasted around 30-45 minutes. Each participant is asked to join a ZOOM meeting channel, and I provided the online call codes. The interviews started with warm-up questions about participants' daily time experiences. I followed three different ice-breaking strategies to bring the topic to procrastination. These strategies were:

1. Asking for a memory or a story where the participant consciously felt that he/she was procrastinating
2. Asking the participant's definition of procrastination from the recruitment survey that s/he completed prior to interviews
3. Asking the participant's typical day at work and how s/he managed time, and when were moments s/he was procrastinating

After the warm-up, interviews continued by talking deeply about procrastination time. Participants were asked to describe the following:

- how they defined procrastination time
- how procrastination time was experienced
- how procrastination time intersected with work and non-work-related time
- how procrastination time would be managed in their daily work life
- suggestions for designing time management solutions (if participants had felt there was a problem in their time management practices)

After the interviews, I started analyzing the results using thematic analysis similar to the first study (Braun & Clarke, 2006). I started analyzing the interview data by first transcribing all the recordings. In the first round, I coded all the interview data descriptively in an online excel table using existing themes from the first study. I gained more profound knowledge about how procrastination time is experienced and how time is perceived during work time. In the analysis process of the interviews, I started mapping

the themes from the first study into the extracted data sheet. I looked for converging, diverging, overlapping, and contrasting themes. The themes started emerging around procrastination, time, and work. This process helped me to familiarize myself with the raw data. After that, I coded each participant's response using initial themes from the first study. All participants were anonymized, and nicknames were given to prevent coding bias (e.g., P1, P2, ...). This step expanded the themes from the Online Urban Dictionary analysis.

In the second round, the initial coding is shared with two more researchers, and each researcher carefully checked, and a mutual agreement is obtained about the emerging themes. In this step, we decided to add another researcher who had a strong background in design to assist in transferring the themes into design insights. Overall, the coding took two months after the data collection was completed. In the second study, I found out that themes from the first study were supported and expanded through work and non-work-related deadlines and their relation to time. The findings expanded the OUD study themes by how procrastination time can be considered a beneficial trait in the work context, what might be other triggers to start or stop procrastination, and last but not least, how procrastination time can be measured differently. Lastly, we checked the updated themes with the OUD quotes. In the next chapter, I present both findings of the studies.

Chapter 4:

FINDINGS

4.1 Unpacking Procrastination Time in Online Urban Dictionary

The findings presented here describe Urban Dictionary Members' (UDMs) experiences with procrastination time. 717 entries were thematically analyzed, and the analysis revealed inspiration points on how the time experienced in procrastination is perceived as something intersecting with deadlines, clocks, and similar concepts. The entries showed problematic parts of the numerical and objective understanding of time. The dictionary members mentioned their strategies to deal with the time, such as creating narratives to disrupt the deadline pressure on them and illustrating the importance of developing a sense of flow in the given time. The most important outcomes are

4.1.1 Bottom-up Definitions of Procrastination Time

The entries defined procrastination time as a period when there was a deadline to be completed or an upcoming work (e.g., completing tasks or reporting things) to be done in a specific time. There were a total of 191 entries, including (starting the entry with a definition or completing the entry with a definition) a definition about procrastination. The members described procrastination time as something experienced individually, bounded by the deadline concept (e.g., referring to deadline entries in their posts), and usually associated with deskwork. For example, in entry 102, the member shared his/her overall observation on how procrastination time was perceived in this online urban dictionary.

From checking the overall entries, when I look at what has been written, it [#procrastination] is the title that pushes me to generalization. In general, when this situation is considered, rather than focusing on the type of work, it draws attention that these works always need to be done alone (See: moments when loneliness is understood.) Of course, however, these works usually seem to be related to writing/reporting, happening in front of a screen or desktop, and requiring a delivery date (See: deadline), which can most likely be done by staying at home. (Entry 102)

The entries defined spending time in procrastination as a counter-act for deadlines or tasks given to the individuals without asking about their willingness. This sometimes resulted in rethinking the meaning of the deadlines, from a point to be reached to a time period for free exploration of “self.” At other times, curiosity about other things overrode the deadline stress. For example, entry 172 exemplified this situation through an “unintentional resistance” situation. Rather than completing the main task, the member counter-acted to the situation by overriding it through free exploration and spending time on different things, liberating himself/herself from the classical boundaries of time. The members shared their unwillingness to complete the tasks to the deadlines if they were not reflecting expectations.

Procrastination is a form of unintentional resistance to being controlled and commissioned by something. A game like a freelancer can serve as an example of

this. That is, procrastination is a sign that instead of doing the tasks specified in the game, it is trying to satisfy curiosity, such as \"let me see where the border of this map ends\" or \"how close can this get to the sun?\" [...] (Entry 172)

Overall, UDMs defined procrastination time in many different ways. As shared in this theme, the most recurring definitions were 1) procrastination time as a personal and individualistic topic that usually comes into consideration when there are deadlines and 2) procrastination time as a counter-act to the deadline pressure. These two definitions illustrated overlapping aspects of “deadline” and the work that needed to be completed. The dictionary members referred to phrases such as “the work that needs to be done,” “delaying a task,” and “a task that is required to be completed” as different definitions of deadlines. They mentioned these phrases to illustrate the initiating point of procrastination time. Then UDMs moved how they experienced procrastination time with deadlines and further elaborated on the mismatches they have experienced.

4.1.2 Characterizing Deadline Pressure by Using Metaphors

The UDMs shared diverse expressions for characterizing procrastination, time, and deadline interconnectedness. From literature examples to song lyrics, UDMs shared a wide range of definitions of procrastination and how time is attached to the concept. Members’ stories were frequently aligned around a fictional and self-defined narrative of the time while procrastinating. Their unique expressions about procrastination gave examples of how to disrupt linear time and its expectations. The expressions illustrated deadline pressure by utilizing similarly fictional expression methods. These methods were: 1) creating narratives and stories through metaphors and 2) making exaggerated storifications about procrastination time. For example, Entry 615 is an example of how a UDM expressed deadline as rising doors, and the progress toward the deadline was acquired through thinking about how to reach the doors or making the plan. The entries continued elaborating on fiction as a means of communication on how procrastination time was perceived.

It's [deadline] as if doors are rising in front of me, and next to me are wood, nails, saws... I need to build the ladder to get through the door I want, but I keep thinking

about which one to go through, how high I will dare to go, or if the ladder I've built will carry me. That's why I've been sitting for years, looking at the materials and doors I have in my hand and spending time. Because I thought of the perfect plan, and now, I'm just saying, "you should try it instead of thinking." It's like if once I go up, I can't go down. [...] (Entry 615)

The UDMs emphasized telling exaggerated stories about procrastination time as the second most repeated expression method. The general approach used daily life examples in such expressions and provided a detailed narrative, including time pressure. These narratives focused on how procrastination time is experienced and the feelings embedded in it. For example, in entry 6, the UDM gave a rich account of procrastination time, mentioning that having confidence, self-relief, and feeling good was vital while procrastinating.

*(See: of that which I am the king) In this country where I rule, we will let go of all kinds of boring, non-funny, tiring, and challenging work from morning to night. We don't know if it's because of its water or air, we say, put all kinds of obligations and impositions away unless it gets too tight. I know that this is why my subjects love and respect me so much. I hear from time to time that there are people who are thinking of dethroning me, but I don't give a [****] because who will get up early here, take up their weapons, come to my palace, bypass my guards hanging in front of the door, find me by the pool and threaten me... too much to do. And even if they take me down and replace me, how will they get their [***] up and deal with the administration. I know my people well because we have the same blood and, therefore, the same temper. They can't deal with such troublesome things. I will say that this space is so delicate in fettle. If you do not feel lazy, come, we have plenty of sunbeds, we are waiting for you. For the national anthem of my kingdom (see, I am the king of procrastination). (Entry 6)*

The narratives continued, taking it to another level by describing procrastination as something alive or that lives, such as building and defining a character around it to understand its relationship with time. For example, in entry 56, procrastination turned into a human-like being that appeared as an evil chauffeur when the member acted and

gave hints on when s/he “needed to stop working.” *An enemy [Procrastination] instantly leaves the place after beating you very well and pushing you to open a song and check the to-do list. It’s the private chauffeur of the unhappiness. (Entry 56).*

The overall non-linear strategies visualized UDMs' struggles in catching up with the deadline pressure and the given time to complete those deadlines. The members used the most known metaphors (e.g., attaching the whole procrastination to a kingdom metaphor) to make sense of the upcoming deadlines and better tried to visualize the situation that they were in by using the visual cues that are common to them. The characterization of procrastination helped them to show how the struggles around a given time can be better expressed.

4.1.3 Efforts for Managing Time at the Intersection of Clocks and Deadlines

The online urban dictionary entries illustrated that the intersections between clock time (numeric time), deadlines, and members’ definitions of procrastination time created a complex blurry space and caused conflicting situations in the “given time” (time to complete a deadline). This blurry space led members to spend time in procrastination moments. In entry 358, the concepts such as “imaginary starting point,” “tight deadline,” and “need to start” came together to create a manageable time in the beginning, but later losing control resulted in perceiving “how much time left” as a self-conflict.

the procrastinator is often remarkably optimistic about his ability to complete a task on a tight deadline; this is usually accompanied by expressions of reassurance that everything is under control. (Therefore, there is no need to start.) Lulled by a false sense of security, time passes. At some point, he crosses over an imaginary starting time and suddenly realizes, \oh no! I am not in control! there isn't enough time! \" (Entry 358)

The conflicts occurred more when members could not grasp the amount of time they had for a deadline and when there were mismatches between “given” and “perceived” time. As seen in entry 535, the member gives examples for these mismatches, describing a conflict between given and perceived time, and elaborates on them along with the

mental mismatches s/he has experienced (e.g., chilling out vs. extreme lack of motivation). These occasions often occurred because deadlines were perceived as another set of numbers to be reached (a static thing), just like numbers in the clocks, but time was perceived as a dynamic and moving concept.

[...] Actually, there is tons of information on the internet; anyway, I will check them later. Kidding aside, when I look over myself, I see the following: 1. Problem with the time perception. Having the feeling of "somehow there is more time" 2. Problem with delaying gratification, necessarily having something preferable, or finding that thing at any cost. 3. Perceiving the delayed "thing" as too small or too big than usual. If it is small: see point 1; if it is big: Chillout; I'll take care of it in a more relaxed time. 4. extreme aversion/lack of motivation. [...] (Entry 535)

To create a sense of movement (in time) and solve conflicts, the entries mentioned “what else” can be done in the given time. The members came up with different suggestions, such as completing alternative things and acquiring new skills. For example, in entry 130, the member redefined a new measure of success by acquiring alternative “side skills” related to the main work that s/he had to achieve and further soothed by a mental relief statement.

There are 4 days left for the delivery of the website that I was supposed to deliver in 10 days, but I still haven't started. Some of the things I've done for 6 days: 1-learning “asp” when there is no need (I write the page with “php”) 2-learning the “mvc” structure 3-downloading the “cakephp” tutorial but never looking at it 4-learning to change the “url” on the page using ajax. At least I'm deceiving myself that I'm not doing any empty work. (Entry 130)

Entries criticized that existing digital time management tools did not work in the case of a conflict. In many cases, time management tools failed to reflect the members' needs while dealing with deadlines. For example, in entry 389, the member reflected that the “stayfocused” and similar software were not working while procrastinating. Although this problem occurred due to a lack of assistance from the digital tool, in the bigger picture, these conflicts revealed deeper tensions around what would happen if the given time had

not cared. In many cases, similar to entry 389, the UDMs either “somehow” managed to solve the conflict (without feeling satisfied) or decided to experience procrastination time to tension.

Procrastination is a sickness in which "stayfocused" style plugins don't work. "Other tools > extensions > remove stayfocused." That's it, it's over, it doesn't work, and yes, I think it's a disease. I think the worst part of procrastination is this: carelessness. Even if you leave the work to the last moment, you do it somehow, but it is worse than not doing the work because you wouldn't pay enough attention due to timelessness [...] (Entry 389)

Intersecting with clock time, deadlines, and the members’ perceptions of time showed that this intersection created a blurry space and made time challenging to experience, such as losing the sense of duration or quantity of time. In most cases, the feeling of being stuck in time emerged when clock time and deadline pressure created tensions among individuals. These occasions led members to create an effort to manage their time and, if not successful, resulted in spending time procrastinating.

4.1.4 Dealing with Deadlines through Tangible Motivations

The members paid attention to developing tangible motivations to deal with deadlines. First, they showed that having a divide-and-conquer approach (also a tangible act) to completing things is crucial. They criticized if the deadlines (or the work) were perceived as too big to handle; they tried to divide it into manageable pieces by creating to-do lists and itemizing the things. For example, in entry 326, the member gave a detailed description of how splitting the main work into elements was helping to overcome procrastination. Further, s/he illustrated that having such pieces created a notion of continuation toward the deadline and a feeling of progress.

One of the most effective solutions is to make a list. You need to do it by writing on paper, not in your mind. When making a list, instead of writing the work like a mass or a whole, you need to write each of the elements in work as separate items. Because it helps solve the problematic parts of the work and prevents the feeling of procrastination caused by not knowing what to do and getting lost, as you complete

the elements, you should definitely ex out (cross out) what has been done!! It would also be good to write down and cross out the work that has already been started or just finished in the list. This gives the feeling of continuing something that has been partially taken care of rather than starting work you have never done. Because having something that is already done, makes the rest to be done easier. Also, the first item [a cross-out item] supports the second item since breaking the work into its elements and listing it that way gives you the opportunity to cross out one of those parts that you completed. Otherwise, you wouldn't cross out anything even if you start, and there wouldn't be any feeling of completion because the work wouldn't be completed even though it would be something that you have done. When this happens, the desire to complete that work goes away. (Entry 326)

Second, entries revealed the importance of turning the main work and elements into physical and graspable things. The members mentioned the importance of visualizing the deadlines, the progression of the deadlines, and the main work to be completed. This was done in many different forms. On some occasions, visualization was done by taking a pen and paper, writing things, and crossing them (e.g., entry 326). On other occasions, UDMs materialized “the process” of completing a deadline. For example, in entry 365, the member explained which steps were to complete the main work by giving a detailed and tangible description of the process.

*The more we have clarified the way to complete a deadline in our minds, the easier it is to start that one; [...] If we are too lazy to start work, it may be helpful to try to clarify it in our minds on "how to do it." For example, if we are going to wash the dishes, we can create a list like this: *You pick up the sponge. *You spray the dish soap in a way that draws an S shape on the sponge.* Then you take a pot in your hand and run water over it.* If there are crumbs in the pot, you rub the wire over the pot.* After the crumbs in the pot come out well, you throw these crumbs in the trash with your hand.* Then, you put the sponge in the pot; you rub the pan into a lather. (Entry 365)*

Overall, itemization and materialization of things were essential aspects of dealing with the deadlines and the time that revolved around them. To deal with this issue,

developing tangible motivations were perceived as a successful strategy according to UDMs' entries.

4.1.5 *Redefining the Flow in Given Time*

The entries revealed the importance of creating a feeling of flow in time. Flow, in this case, was defined by (1) emphasizing the importance of swaps between different paces that allows UDMs to bring in their full capacities, (2) defining bids of time via well-known things such as sequential activities, which allow filling the time and (3) using more natural and connected to daily life endpoints for defining deadlines. In the entries, swaps between different paces were associated with the mismatches between slowing down and speeding up according to the deadline. In procrastination time, at first, slowing down was happening due to various reasons such as mood changes, self-motivation, and time to complete the deadline. However, towards the deadline, there was a need to accelerate things radically (e.g., in Entry 411, the UDM finished a three-week job in 24 hours), which allowed UDMs to bring their full capacities.

The client gave three weeks for the presentation; you keep getting other projects, spending weeks on the go, waking up late, and dealing with a million other things. Then your last 24 hours before the presentation starts, and you sit down and finish it badly. For a week, its stress and fatigue would not end. After you relax, you would realize that if you had spared just one hour every day for three weeks, it would be much better, but you finished the job in 10-15 hours on the last day. You would say that I won't do this from now on, and when a new project comes, the same thing starts again (Entry 411)

Defining bids of pace was created and utilized by a series of everyday life events and motivations around the individual, allowing him/her to fill the time. Here, filling the time meant creating new possibilities according to the member's needs before starting a deadline. For example, in entry 590, the member shared daily life activities of cleaning the room, making tea, or washing the clothes as examples of events; and money and location as examples of tangible motivations and concluding the entry by illustrating how these aspects filled the time to start to work.

[...] as for my personal experience, I can define it [procrastination] as the lack of motivation for a job that needs to be done under current conditions, and a lot of irrelevant work being done to create these conditions. that is, there must already be motivation so that we do not try to create it. For example, money is often a good motivation because it has a physical presence, and you feel like you're getting something in return. Saying "I can't work at home" and going to cafes or places like a culture house often helps this motivation to build up quickly. In addition, statements such as "I will have a very good life if I finish this" are insufficient to create motivation (at least for me). Because there is no concrete truth, or such discourses do not increase his current enthusiasm. On the contrary, it may even lead to divergence from the subject. "I will create a nicer environment if I tidy my room before work." "The clothes have piled up well; let me wash them too." "I'll also make a nice coffee. No, I'm at home anyway; let me brew tea." "I'll call my girlfriend before I start, or else I would forget..." We did all of this to start working. Our motivation was to have a better life in the future, but by doing all this, we have already achieved it [...]" (Entry 590)

Being more in alignment with natural endpoints was associated with occasional changes in the UDMs. The members shared their insights on when and on which occasions different paces were utilized more. The changes mainly consisted of specific periods such as weekly or seasonal changes (e.g., entry 80: the arrival of the spring is defined as an occasion for slowing down). *It [procrastination] is a state of inertia; it overflows with the arrival of spring, the number of days without producing anything increases exponentially. (Entry 80)*

A new type of time flow was created by changing the perceptions towards paces, filling the time with bids of sequential time-requiring activities, and reflecting on the natural endpoints. The findings in this theme illustrated that redefining the flow of time with these aspects created a sense of progress toward the statical notion of deadlines.

4.2 Interviews with Self-Identified Procrastinators

In the second study, I conducted eight interviews with self-identified procrastinators to further understand the interconnectedness of deadlines and time pressure. The analysis expanded online urban dictionary findings by scrutinizing why and how procrastinators lived, expressed, and perceived procrastination time in real-life settings and how they utilized it to reveal and resolve conflicts. I conducted these interviews face-to-face (online) and in the participants' daily workplace, reducing the bias that anonymous dictionary authors might cause. Moreover, I obtained detailed information about how procrastination time interacted with work-related time. In this section, I present the findings under four main themes.

4.2.1 Emphasizing the Benefits of Procrastination

Differentiating from the common definitions of procrastination (procrastination as a habit to overcome), the participants' time spent on procrastination was experienced differently. They deepened the definitions made by the UDMs by emphasizing the mental stances toward time pressure. Throughout the interviews, it was revealed that procrastination was used as a time to shift from negative experiences and emotions of work into positive experiences and feelings. For most of the participants, procrastination time was experienced mentally and positively. Participants used procrastination space to their benefit, such as a treat after a stressful and dense work time (e.g., of P2).

P2: I think there is an emotional threshold. For example, if I am doing something related with work, after a while, I want to spare some time for myself, e.g., after the shift. After that, dealing with or spending time on that work becomes annoying, like an enemy that steals from me.

Several participants perceived procrastination time as a time that they could own. They managed and took time from their "defined work time" and spent it in procrastination time. They criticized work time, its meaning, value, and how it created tensions and emotional burdens on them (as seen in the example of P3) and decided to take counteractions by spending time in procrastination and feeling good afterward (e.g., doing the work in the defined work time slower than their average pace).

P3: I mean, I started doing it [work] slower now. I was more motivated back then, and I was on the computer constantly trying to do whatever I could to contribute. Since that [problem with my employer about work] demotivated me a little bit, I started procrastinating there. I exaggerated the situation like I was not going to start construction at the end anyways!

Furthermore, procrastination time turned into a mental-break space for the participants. They mentioned that it relieved the work stress, created positive emotions towards the upcoming leisure time, or felt secure in procrastination time.

P4: I say it [procrastination] is voluntarily delayed because when I do work at this moment, I am doing them with great motivation. I mean smelling that coffee while pouring it, singing, or dancing while removing the dust when I am doing them. Since I do these tasks without complaining, I am doing them with great passion. That is why I can call it voluntary procrastination.

As seen in the example of P4, the time spent on procrastination became a joyful moment for associating and appreciating the activities done in this period. It helped her to have some self-relief moments. Different emotions and stances led participants to start or stop working and move themselves to procrastination time. Overall, this theme illustrated that when stances, emotions, and motivations towards work-related time occur, procrastination time was perceived as a time for transitioning from unwanted, unmotivated, and negative situations into a self-benefit space.

4.2.2 Taking Care of “My” Time while Procrastinating

The interviews revealed certain mismatching and conflicting work time activities that move participants to procrastination. Participants mentioned points like if the work is:

- too complex than it is expected (e.g., if it is passing the capacity of the worker)
- too simple to put effort into (e.g., if it is downgrading the worker’s capacity)
- too big to perceive what the intended outcome of spending time on (e.g., if the outcome of the work is hard to perceive by the worker)

- creating disagreements between the employee and the employer (e.g., self-doubt due to lack of guidance from the employer).

Interestingly, the situations mentioned above and similar pushed participants to fix time-related mismatches, and procrastination time occurred as a time that participants could own and take care of. They mentioned that spending time on procrastination resulted in fewer conflicts and mismatches. They mentioned that procrastination time occurred as a solution for controlling time since they felt free to do whatever they could while procrastinating.

Participants also mentioned that taking care of procrastination time supported having better transitions between “work” and “non-work” activities. The transitions felt more natural and happened intuitively. It further created opportunities for “small works” (considered less critical deadlines) to be completed faster than expected (e.g., P1).

P1: Meanwhile, it might be something again related to work while you are procrastinating the work. To consider it procrastination, it is not necessary to slack. I mean that you might be doing less critical work, although you are expected to do a more critical one.

Throughout the work time, procrastination time enabled certain moments for questioning the value of the given work time by the current structures (e.g., employer-defined work hours), re-considering what “big” or “small” work is, and doing self-motivated other work such as P2 mentions: *For example, I never delay R&D work, I do them with motivation, but this is a highly personal thing for me.* Moreover, it made employees open-minded about the given work on certain occasions. On other occasions, procrastination time turned into a skill of taking care of defined work time more efficiently (e.g., P3).

P3: Sometimes, my mind becomes more creative and active with a feeling of completing it [work] swiftly. For example, when I do that work for a long time in a loose way, it might become inefficient. I am getting fed from working swiftly. I think until that certain time and when that moment comes, the limited time [since it is already spent on procrastination] gives me power, and I transfer the things on my mind.

Overall, owning procrastination time and taking care of it helped participants to have better transitions between work and non-work-related tasks. This theme revealed that spending time in procrastination was considered a self-controlled management practice to take care of work-related problems. The participants provided detailed descriptions that they procrastinated when there were mismatches and conflicts in employer-given time. This theme deepened the findings in the first study by how work-related time is utilized through procrastination and managing activities to individuals' interests.

4.2.3 Triggers of Procrastination Time when Deadlines are Approaching

The interviews discovered ignition points to start, adapt or end procrastination time and revealed deeper insights on motivators for starting, managing, or concluding procrastination. Participants mentioned that internal (e.g., self-triggers) and external (e.g., deadlines) factors trigger motivations to move from work to procrastination or the other way around. Triggers of procrastination time are related to how procrastination starts and ends, showing how participants made sense of their time when deadlines were approaching. Participants elaborated on specific motivations to initiate or conclude procrastination time. The employer's attitude towards the work was critical, i.e., if the employer is disengaged from the work, it can trigger the employee to procrastinate.

Moreover, certain self-determined moments (e.g., P7's self-triggered house cleaning time), relations with co-workers (e.g., if there is a meeting to be avoided that day, P5 procrastinates in the morning more), and "likeliness" of the given work (e.g., if it is research work, he works more motivated and does not initiate procrastination) were equally essential to manage procrastination time. Another motivator was to perceive the progress of the work in the given time and sense the success feeling. If these two were not visible, participants had more tendency to start procrastinating.

P5: [...] or if I had a problem with someone at the office, if I had a bad argument with someone, or if there are some things to be discussed in tomorrow's meeting, I get anxious. When these kinds of things happen, I am doing procrastination to run away from the environment or the work.

Most participants emphasized their internal triggers as a way to transition into work time. They emphasized that intuitions and feelings played essential roles in procrastinating time management. These intuitions could be created internally (self-motivation) or externally (the mental load of pushing deadlines). They elaborated on these triggers for transitioning from work to procrastination (or the opposite).

Participants also shared their tactics to prevent or enhance their time on procrastination. While some tactics were related to preventing excessive time use in procrastination, the others were about how they make this time more valuable to themselves.

For example, P3 mentioned: *In the work-related part, I am more like, “I should not do this now [task]; I have another task to do,” and I imbue myself this way. Not like “there is a lot more,” but more like “it would be nice for me to do this task in 1 hour; why would it last for 2 hours”. I started imbuing myself in positive ways. I think it works a little bit.*

This theme informed and inspired us about participants’ strategies on “how to make sense of the given time.” Looking at the triggering points, the findings revealed when and how individuals start procrastinating and when and how they conclude procrastinating. Managing procrastination time illustrated the disconnection points (e.g., mental-load point to leave work time) in work time. Participants showed how they controlled procrastination time to initiate or disregard tension points in work-related activities. They managed transitions in tense situations to live and express procrastination time better.

4.2.4 Measuring the Continuity of Time through Self-Invented Methods

The details on the measurement of procrastination time are the fourth theme that emerged and was put on top of the findings of the UDMs. Participants mentioned how the flow of time was achieved through alternative methods they developed. Firstly, procrastination time was measured by how much responsibility the individual skipped or put thought into his/her work and leisure time. For example, one participant said: *There has never been a person who left me by saying, “You made me wait very long.” It would*

have been more striking in my life if I had something like that. I bargain for people's trust in me.

Secondly, participants measured procrastination time by how many activities were done in this period. They emphasized the continuity of the activities and mentioned that these activities followed each other naturally and organically, without an external push. As in the example of P1, he mentioned the activities that were followed in the morning and were in a flow:

For example, when I go to work early in the morning, I say let me have a coffee first, and I drink coffee until 9:30. Actually, that coffee is not something vital. Then I go like, let me read the news and afterward read some articles, let me do this and let me do that, and suddenly it becomes 10:30. Then there is lunch at 12:30 anyways. I go and ask a random person a random question... (P1)

Moreover, no exact time for procrastination was determined by clocks and numbers. For instance, participants mentioned that there is no such thing as starting procrastination at 8:00 and finishing at 11:00 and that they perceived procrastination time as a by-product of the activities they followed. Participants also measured procrastination time by their emotional trade-offs. To explain that, they emphasized the mental gains or losses that they had or not while spending time procrastination and skipping the deadline.

E.g., P4: Because I can spend time very fast around these [procrastination activities, watching TV series] and while I spend time in them, I feel very good and happy for myself. I either watch something funny or action genre. I mean, maybe the time I spend is not very productive, but it becomes quality time with joy for me.

Finally, participants measured procrastination time by the consequences it caused in their work and leisure time. For example, one participant said: *I should not be doing it usually [delaying]; if I go there, I know I will be late, but as a result, I used Cab rather than public transportation. I was still late, but instead of half an hour, it was 10 minutes.* Since she procrastinated before a meeting to prepare herself, she measured procrastination

time with how much she could give up on her leisure time. She chose to spend time procrastinating on meeting her meeting with friends.

Overall, continuity of time was achieved through 1) the amount of responsibility skipped or taken into consideration, 2) the number of activities that followed each other, 3) emotional trade-offs they paid on catching deadlines, and 4) the consequences of their actions towards deadlines. All these together led participants to experience time more continuously and supported them in dealing with the deadline pressures.

Chapter 5:

DISCUSSION

Unpacking the procrastination time provided a new narrative of how time is expressed, especially when there is deadline pressure. The studies showed that time is understood twofold 1) imposed time (things that need to be done) and 2) lived time (things that are getting done). Several instances showed that procrastination is consumed as blurriness in the time perception, especially before a deadline. In the discussion, I contextualize the results with the existing time studies in HCI and pinpoint the contrasts and opportunities for future time & HCI studies. Then, I share design insights on how the findings of this dissertation can support and enrich the design of technologies that centralizes time management tools.

5.1 Towards a More Nuanced Understanding of Procrastination Time for Deadlines

Understanding procrastination time revealed subjective aspects between the current utilization of time (objective and numerical) and the individual's expectations. Procrastination time revealed a continuous, complex, and highly individualized coordination effort to tackle the time pressure. A body of literature on HCI focuses on the social coordination of time (Light & Petrelli, 2014; Lindley, 2015; Martin & Holtzman, 2011; Pschetz & Bastian, 2018; Shih et al., 2015). The studies argue the complexity of multiple time perceptions in daily life practices from different angles. These angles emphasize the collectivity of the temporal practices (Lindley, 2015), adopting concepts such as Timebanking for community building (Shih et al., 2015) and embracing special times when people's temporal patterns intersect between slow and fast and material and

immaterial aspects around the individual (Light & Petrelli, 2014). While these studies contributed to the complexity of time and how it is conceptualized in social, moral, political, and hierarchical models, the procrastination case showed how the members expressed mismatches by creating narratives, developing tangible motivations, and defining alternative continuity of time. They made mismatches visible through their actions (e.g., creating a motivation to go to a coffee shop to handle upcoming deadlines pressure). Therefore, analyzing procrastination time held the potential for discovering the complexity of one's need and claim for a self-defined temporality and its relation to deadlines. For example, procrastination time gave hints on how time is changed and expressed towards the deadlines, focusing on the changes between slow and fast and material and immaterial aspects around the individual.

The procrastination case highlighted discussions around temporality by supplying unique examples of procrastinators' approaches to time beyond being fast or slow. This unique time frame challenged the Western approach to temporality (time as a matter of speed (Odom, Lindley, et al., 2018)). Most HCI literature considers temporality as either acceleration (for being efficient) or slowing down (counterargument for acceleration). Artifacts that are designed from a slow technology lens (e.g., (A. Y. S. Chen et al., 2019; Heshmat et al., 2020; Odom, Wakkary, et al., 2018; Odom & Duel, 2018; Zhong, 2021)) provide a rich design space for expanding interaction modalities in HCI towards slow design direction. The findings in this dissertation add to previous literature by rethinking temporality from the fast-slow axis to considering alternative temporalities that intersect with each other to create a continuity in time. Looking at procrastination time revealed efforts on managing one's speed of time, especially before a given deadline. The findings provided alternative forms of temporal spaces to create a sense of the continuity of time. For example, to keep up with the accelerating pressure of the deadline, the urban dictionary members utilized and adjusted the temporality of remaining time by filling it with activities or accomplishing other tasks, enabling them to play with the perception of speed. They compensated for the accelerated perception of time by illustrating the itemization of things that can be done to show that they are keeping up with the constant accelerating tempo. This opens up a further question for the emerging theorization of slowness in HCI design research (Odom et al., 2021), i.e., what might be the other forms of subjective temporalities that can be implemented in the design of time management tools? The findings of this paper illustrated example situations on this question.

According to procrastinators' time perceptions, the pace of procrastination time is in constant flux (in the slow-fast axis) when there is a deadline to reach. The notion of acceleration or slowing down needs to be balanced with other things to achieve the desired point or deadline without ending up with adverse outcomes. For example, in this case, these "things" were tangible motivations (e.g., to-do lists) and occasional changes around the individuals. Next, supporting tangible expressions of time (e.g., creating narratives) was needed to understand better how much acceleration or slowing down was required to support subjective pace. Together with these, the findings illustrated that subjective temporalities were constructed with the materiality and dynamic changes around the individual.

The studies in this dissertation provided further evidence that supports prior research on procrastination and how people experience and perceive procrastination time neither as work nor leisure time (Foulonneau et al., 2016; Sirois, 2014). It showed that procrastination time could be spent for self-improvement (e.g., learning a new skill) or to create personal space for refuge during conflicting situations (e.g., avoiding conflict with the boss and going to work later). The findings also provided insights that extend this perception. It is found that procrastination time represents a transitional time between work and leisure time in which the individual utilizes control and ownership. While procrastination time is considered work time on certain occasions (e.g., doing smaller tasks), it is perceived as a place for leisure moments with others (e.g., taking a break and doing a puzzle).

All in all, understanding procrastination time offered a complex and blurry space in which subjective time perceptions are visible when deadline pressure is approaching. This space also revealed how multiple temporal activities intersect to create a sense of continuity in time. Overlapping with some previous behavioral research on procrastination, the findings supported that spending time in procrastination was not perceived as work or leisure. Procrastination time was perceived as a unique space, and we believe that understanding this space was inspirational for many HCI studies on future time-related technologies. In the shed of the dissertation findings, I provide 5 design insights that can support and inspire designing better time management technologies. Design insights aim to transfer the discussions around procrastination time into actionable insights for designers, HCI, and design researchers.

5.2 *Design Insights for Future Time Management Technologies*

Through understanding procrastination time for HCI analysis of 717 entries and 8 interviews, I present five main implications for the design of future time management tools. This dissertation showed that in the instances where the current time management tools are failing, looking into people's real-life practices, such as procrastination, can inspire designers differently. The analyses revealed 5 inspirational design insights for designing better time management tools. I share insights derived from the study under the following themes.

5.2.1 *Design Insight 1: Use Different Forms of Paces to Create a Sense of Ongoingness while Deadlines are Approaching*

In both groups (UDMs and procrastinators), it is observed that there is an emerging feeling of "being stuck in time." This feeling was increasing for UDMs and self-identified procrastinators when the deadlines were approaching. They defined being stuck in time as a notion that time is not flowing or continuing. Most participants mentioned that this feeling was triggered more due to the static nature of the deadlines. They mentioned that since deadlines were considered a "point" to reach, the progress toward them was not perceived as continuous. Because of this situation, the time needed towards a deadline was perceived as static too. When the time was perceived as static, participants mentioned that this caused them to procrastinate. They decided to spend time procrastinating because they could create a sense of ongoingness in time. They used this as one of the main strategies to pass the time. To run away from the feeling of being stuck in time, UDMs and self-identified procrastinators utilized different activities that required different paces. For example, from spending hours and days doing a puzzle to quickly getting a coffee from the coffee machine or quickly checking the daily news, these activities helped them create a sense of ongoingness.

The overarching finding was that procrastination time was perceived as a period in which multiple paces were observed and further considered an escape from static deadlines. Procrastination time offered a notion of flow in time as an alternative to a measurable pace. The intersection of multiple paces supported creating the sense of ongoingness in time and fostered the feeling of completion (along with the feeling of success). For example, when a procrastinator takes coffee from the coffee machine, it is

perceived as a micro-success moment. On a bigger scale, when the puzzle is completed after a week, it is considered a significant success. The findings showed that these activities and their required times could vary from mundane daily tasks to complex niche tasks. The only important fact is that such temporalities (different paces) were constantly changing to foster the feeling of ongoingness and to break the static notion of time towards the deadlines. I suggest that if this insight is applied to time management tools, it can further open up new ways of looking at temporal studies in HCI.

Implications of the Design Insight 1 to Time Management Applications:

- Highlight the moments of completion in the calendars, especially when the deadline is approaching (e.g., notify users when any piece is completed by the deadline)
- Integrate gamification elements to time management applications to support moments of success even more when the deadlines are approaching (e.g., have different badges and trophies based on the pace of the required task)
- Foster the feeling of ongoingness and continuity in calendar tasks (e.g., visualize task A completed and task B started, and they all contribute to deadline C)

Implications of the Design Insight 1 to HCI studies on Temporality:

As discussed in HCI, there is an ongoing need to understand multiple temporal rhythms to support humans' subjective perceptions of time (Odom et al., 2021; Odom, Wakkary, Hol, Naus, Verburg, Amram, & Chen, 2019). Implications of these arguments are visible, particularly in slow design movement (Grosse-Hering et al., 2013; Hallnäs & Redström, 2001). While related work challenges the rapid acceleration of technology through the design of opposite pace (slowness), procrastination time moves beyond the acceleration or slowing down of the technology and embraces the importance of creating a sense of ongoingness to define a specific time period. These insights can be transferred to HCI design research and can be used to enrich the design space of temporality. Since the majority of the HCI studies explore temporality through design artifacts (examples such: (A. Y. S. Chen et al., 2019; Kucera et al., 2021; Odom et al., 2014; Zhong et al., 2021)), I share how findings can be transferred to future design artifacts.

First, HCI researchers can rethink the interaction moments with the artifacts and integrate the concept of “success” based on the criteria defined by the procrastinators. The findings supported that this can be done by creating a sense of completion. For example, revisiting the artifacts that emphasize slow interactions (Odom et al., 2014), anticipation towards the interaction moments can further be followed up with the feeling of success (e.g., seeing the completion of interaction in a radio-shaped object). For example, this feeling can also be supported by the object’s properties (e.g., changing its shape to create wholeness). This would help individuals to better reflect on when the interaction has begun, continued, and concluded, mimicking the agendas of completion in the procrastination time.

Second, the sense of flow can be created by emphasizing transformations in the object’s environment over time and creating a sense of ongoingness. Having a companion-like object adaptable to its temporal environment (being able to blend to multiple paces) can support having a sense of flow in time. It can create a sense of ongoingness, allowing the object to have a more dynamic relationship with its user. For example, we can envision a clock-type desktop object that can adapt itself to seasonal and occasional changes (as mentioned in the findings, with the arrival of the spring, time gets slower, or when the deadline is near, time passes extremely fast). It can visualize multiple temporalities that are happening around the user. The object can create an awareness of which tempo a user can embrace in different situations. It can also assist in slowing down or accelerating to create a continuous ongoingness of time.

5.2.2 Design Insight 2: Use Everyday Life Materials as an Inspiration for Making Deadlines more Tangible

The findings illustrated that when deadlines are approaching, the perception of time transforms into an abstract concept, making it difficult to understand and act on. In many cases, the perception of the remaining time was not apparent to the UDMs and self-identified procrastinators. This resulted in a disconnection between the mind and the body. In many cases, the time was enough to complete the given deadline initially, and mismatches between the given and perceived time were observed when the deadline was approaching. For example, there were instances in which extreme storification of procrastination was shared to better grasp the role of time in it. In other instances, the

daily material world was repeatedly mentioned to “somehow” make the remaining time more definable.

The UDMs and self-identified procrastinators utilized material clues to make sense of their deadlines and time constraints. The self-identified procrastinators shared a detailed description of how materiality around the individual affects time perception. For example, even an activity that requires everyday materials (e.g., washing clothes or crossing out things with pen and paper) plays a critical role in how they react to procrastination. Daily routines and well-known objects surrounding them played an essential part in defining this materiality. The findings further showed that materiality around the individual played a critical role in creating motivations for experiencing time better while there are deadlines. The entries reflected that digital time management tools were failing (e.g., website browsers that limit internet surfacing did not help) to represent the amount of time required to complete a deadline or a work. In many instances, it is repeatedly shared that deadlines were hard to imagine (also difficult to make tangible). This materiality helped participants make deadlines more tangible and perceivable in time. In these critical situations, the object world -and practices around them- became a key factor for re-aligning back to the present.

Implications of the Design Insight 2 Time Representation Tools:

- Support the resonance between mind and body (e.g., implement tangible interactions with digital planning tools such as Trello, Asana, and Jira)
- Move beyond digitalization of the time management applications and focus on the material world around the users (e.g., making required time towards the deadlines more touchable on the screens)
- Utilize available technologies such as the Internet of Things (IoT) to overcome the abstraction of time when deadlines are approaching (e.g., designing connected appliances to visualize time in different objects)

Implications of the Design Insight 2 to HCI studies on Time Tracking:

Altogether, UDMs used their most well-known material and infrastructural properties. In the shed of findings, the materiality around the individuals can be considered as inspirational resources. For example, an interactive companion can play the

procrastinator; a materialized form of the “procrastinator characterization.” Being in conversation with its user (e.g., similar to Objects with Intent (Rozendaal et al., 2019)), this companion can help adjust the individual’s time orientation. This could further offer insights into HCI research by using everyday objects as extensions of time. For example, we can envision an interactive pen that only functions when there is time pressure. This would help individuals to perceive better when the deadline pressure was approaching, materializing it for him/her and allowing interaction with it through tangible aspects. In the shed of findings, we can further imagine a clock that creates a narrative out of its user’s tasks while approaching the deadline, internalizing the materiality of time through narratives. Although we see initial steps for such insights in HCI (e.g., Experience Clock (Yildiz & Coşkun, 2020)), the findings support and call for in-depth research on this topic and designing future time management tools beyond utilizing their one-way-communicative natures.

A growing body of work argues that as technology advances rapidly, our work practices are shifting toward new areas and digitalization of the work takes command in many aspects (Graham et al., 2017). The rise of digital nomads, remote calls with digital interfaces, and working online is widespread (Fuchs, 2014; Punita Duhan, Komal Singh, 2017). The findings showed some contrasting issues of challenging the digitalization of work with the importance of physicality in procrastination time. Still, most HCI studies focus on task efficiency and better digitalization of time tracking (Shin & Yoon, 2021). Furthermore, technologies such as self-monitoring (K. R. Lee et al., 2020) and time regulation (Park et al., 2021) are getting more popular. We can even see the latest integration of time tracking in the google calendar app. (Figure 6). Although these implications offer a wide range of improvements in better reflecting on time, the findings illustrated that they are not reflecting on deadlines and time towards those deadlines. In the shed of the findings, current applications and studies can focus on making deadlines more tangible to prevent time abstraction. This dissertation suggests that everyday materials around individuals play a significant role in achieving this goal.

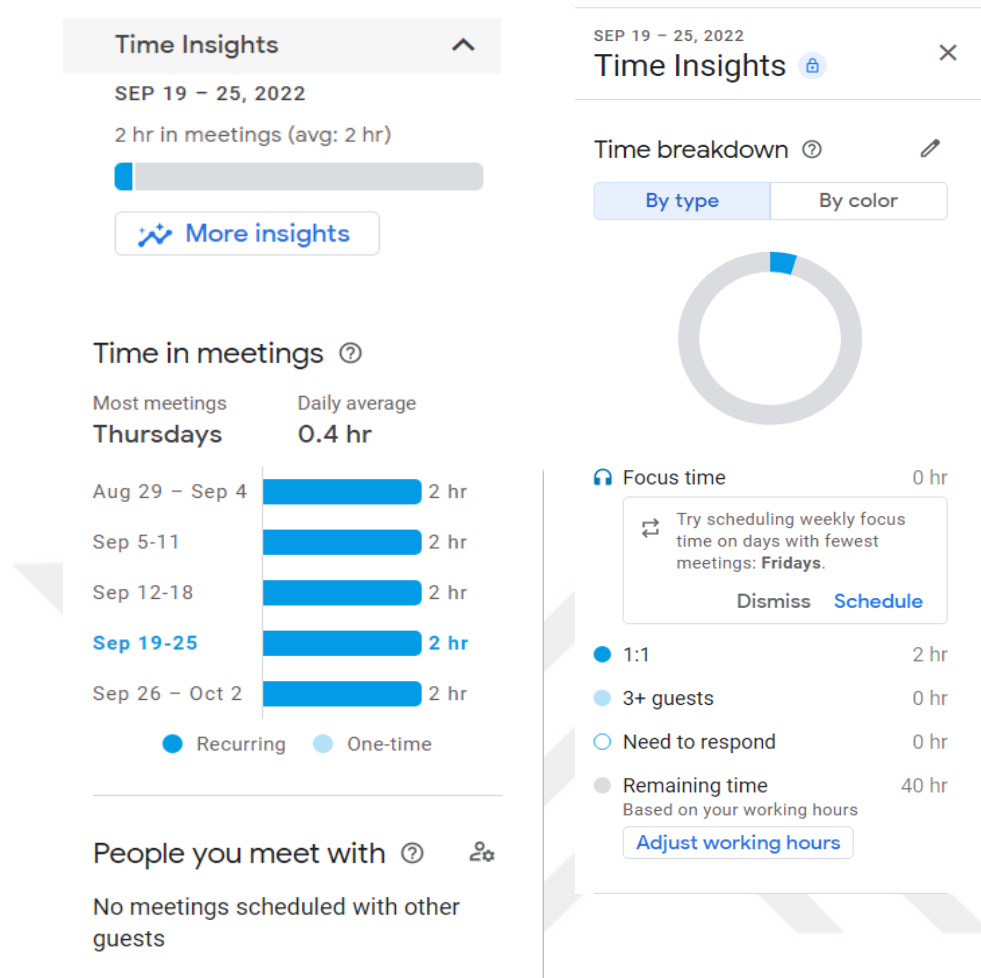


Figure 10: Latest Time Implications by Google. The implications can be found on the Google Calendar application or web browser versions. It visualizes time spent on various activities, such as meetings and locations

5.2.3 Design Insight 3: Stretch the Given Time to Support Solving Conflicting and Mismatching Deadlines

Both studies showed that time is stretched while procrastinating. The findings showed overlapping aspects with Neuroscientist Eagleman's definition of elasticity and time. He mentions this concept as: "Time is this rubbery thing. It stretches out when you really turn your brain resources on [...] Make sure you stretch your mental landscape by putting yourself in situations where you are learning something new." (Burkhard Bilger, 2011; Önalán, 2016). The findings shared instances where self-identified procrastinators stretched the time when conflicts were between the things that must be completed and what they wanted to do. In these instances, self-identified procrastinators utilized their capabilities to their benefit. By making detailed trade-off plans (e.g., swapping deadlines

and tasks rapidly) and enjoying themselves with leisure activities (e.g., writing stories) to fill the time with alternatives (e.g., acquiring alternative skills), they utilized their capacities to the maximum. Further, they highlighted that adding several things after each other such as completing a bunch of “other” small tasks rather than completing the biggest task, created a sense of productivity.

Implications of the Design Insight 3 to Time Representation Tools:

- Suggest alternatives that can be done in the given calendar slot (e.g., if a meeting is canceled, the calendar can illustrate what else can be done in this slot)
- Support acquiring alternative skills between conflicting deadline time periods (e.g., digital calendars can trigger learning small things if a deadline is canceled or rescheduled)

Implications of the Design Insight 3 to HCI studies on Time Representations:

Based on this finding, for example, recent studies focus on alternative representations of calendars and clocks (Arnadottir, 2010; K. R. Lee et al., 2020; S. ho Lee et al., 2019; Yildiz et al., 2021) or humans’ biological signs (Janböcke et al., 2020; Yildiz & Coşkun, 2020). The findings added a new layer to these studies by visualizing “what else can be achieved” in the given time to better stretch the time for its users’ benefits. It further opens up design space for valuing time as a dynamic phenomenon that can change according to different situations (such as when first working on a deadline vs. near completing a deadline). Taking this as an initial start, the HCI researchers can envision interactive tools that visualize different things according to changing perceptions towards the deadline. For example, a tangible desktop-like object (e.g., like DayClo (K. R. Lee et al., 2020)) can visualize alternative skills, such as learning something new, that can be acquired at the beginning of a given task and then later, the object can evolve by visualizing what is already completed and how much time is left for the main task. Meanwhile, it can give clues about the changes in the task loads. This would create flexibility for the user by creating a better connection between past-present and future time perceptions and allowing them to stretch them.

5.2.4 Design Insight 4: Prioritize Organic Time Transitions in Management Applications over Slot-based Approach

The studies revealed that individuals transition from one place to another by controlling their procrastination time. Transitions were visible in which the deadlines were pressuring the most. These transitions occurred in moving between work and leisure moments. When the upcoming deadline perception increased, rapid transitions were more visible and happened more frequently. The studies pointed out that transitions did not occur sharply but were more integrated. The boundaries were often invisible and not possible to detect. These transitions were happening organically and smoothly between work and leisure-related time periods (e.g., reading a small article to going back to a task).

Implications of the Design Insight 4 to Time Management Applications

- Avoid slot-based task calendar divisions and emphasize organic transitions between tasks (e.g., think of new ways of creating continuity in Google Calendars)
- Consider integrating leisure moments while doing digital time planning (e.g., adding coffee breaks and lunch breaks to work calendars)
- Value the process of reaching a calendar slot over fulfillment of it (e.g., designing elements that visualize the progress toward the deadline)

Implications of the Design Insight 4 to Time Management Applications in HCI

Previous literature emphasized the importance of having transitions between work and leisure activities by providing timely notifications to trigger breaks or to prevent digital distractions (e.g., notifications from social media). Designing breaks between work and leisure moments (Kaur et al., 2020; Tseng et al., 2019) and preventing digital distractions at work (Dabbish et al., 2011; Harper et al., 2015) played an essential role in HCI research. Time management tools like Google Calendar and Apple Calendar utilize transitions but separate hourly- bi-weekly slots. These tools measure time numerically as how many slots a person can have or quantified limits of being busy or not (e.g., filling the calendar with X number of meetings). However, studies in this dissertation revealed that when individuals owned their time, they did not measure time with a number of slots to divide it sharply. The findings showed that transitions occur organically during

procrastination time. For example, one participant completed 'small' work to prepare herself for the 'big' work regardless of the number of works. Rather than perceiving time as pieces or slots, the findings included a variety of inspirations pertaining to time management, such as using the chain of activities that follow each other, accumulation of responsibilities that push individuals towards work or procrastination time, and emotions that are derived in particular works. Thus, future time management tools should be designed by considering organic transitions. For example, it is possible to imagine new timekeeping tools that centralize activities over timeslots. Rather than showing the exact numbers of clocks (e.g., meeting at 2:00 pm), these systems can show the activities that will follow each other (e.g., starting the day, working for a while, and then going to lunch).

5.2.5 Design Insight 5: Utilize Procrastination Time for Reducing Mental Pressure caused by Work-related Time

It is shown that work-related time is perceived as a more profound concept than just completing tasks. The findings revealed that emotions, motivations, and feelings could critically determine a person's transition from working time to procrastination time (e.g., displeasure emerging from a given task and moving into watching TV shows). This situation often happens when there is tension, conflict, or mismatch between the “given” and the “perceived” time. For example, an employer demands that work be done within a short deadline, but the employee’s unwillingness pushes him/her to procrastinate. These tensions cause individuals to perceive work time as disconnected, pushing them to extreme mental points (e.g., UDMs and their strong personified descriptions of the given task). Therefore, in this insight, I reflect on how future time management technologies can consider procrastination time from a habit to be tackled to more positive behavior integrated into individuals’ lifestyles to reduce work-related pressure.

The findings illustrated that having procrastination time and owning this time period could benefit one's wellbeing, i.e., being in a self-relief moment after or before a long stressful task. It was repeatedly mentioned that spending time procrastination was not a “bad” thing for mental health. However, it was also a time to find new opportunities for one’s mental well-being (e.g., creating enough time for self-relieving activities). Deriving on this, it is essential to highlight that current time management tools can be redesigned to have the potential to shift the meaning of time management from merely functionality

or apps for effective time management to tools that allow individuals to manage, control, and own their time for self-development and their subjective wellbeing. While current time management apps. Such as Trello and Slack, focus on the tasks to be completed with maximum efficiency. They sometimes fail to capture how an individual might feel or the meaning of self-relief rather than assigning a portion of time to a task.

Implications of the Design Insight 5 to Time Tracking Applications

- Re-consider spending time in procrastination as an opportunity for creating self-relief moments (e.g., foster healthy procrastination moments for relieving deadline stress)
- Create a backdoor in the calendars for emergencies (e.g., always having and using an available timeslot if the time is creating excessive pressure)

The Design insights showed a wide variety of practices that can be learned by understanding procrastinators' time-related practices. Understanding procrastination and its relation to time revealed new opportunities for designing time-focused tracking technologies. Table 4 summarizes each design insight and its implication for practice.

Design Insights	Implications
Use Different Forms of Paces to Create a Sense of Ongoingness while Deadlines are Approaching	Highlight the moments of completion in the calendars, especially when the deadline is approaching
	Integrate gamification elements into time management applications to support moments of success even more when the deadlines are approaching
	Foster the feeling of ongoingness and continuity in calendar tasks
Use Everyday Life Materials as an Inspiration for Making Deadlines more Tangible	Support the resonance between mind and body
	Move beyond the digitalization of time management applications and focus on the material world around the users

	Utilize available technologies such as the Internet of Things (IoT) to overcome the abstraction of time when deadlines are approaching
Stretch the Given Time to Support Solving Conflicting and Mismatching Deadlines	Suggest alternatives that can be done in the given calendar slot
	Support acquiring alternative skills between conflicting deadline periods
Prioritize Organic Time Transitions in Management Applications over Slot-based Approach	Avoid slot-based task calendar divisions and emphasize organic transitions between tasks
	Consider integrating leisure moments while doing digital time planning
	Value the process of reaching a calendar slot over fulfillment of it
Utilize Procrastination Time for Reducing Mental Pressure caused by Work-related Time	Re-consider spending time in procrastination as an opportunity for creating self-relief moments
	Create a backdoor in the calendars for emergency

Table 4: Summary of each design insight and its implication for practice

Chapter 6:

CONCLUSIONS

This dissertation introduced time and HCI literature, explaining the current arguments and approaches. Moving from there, I drew a research gap among the related work and provided a detailed description of time, temporality, and procrastination studies. The formulation of the aim and research questions helped frame this dissertation and gave valuable input for conducting academic research on procrastination time. I explained the methodology and findings of the two studies and reflected on the results of the studies. In this chapter, I will conclude this dissertation by first explaining how the results of this dissertation can be transferred into future studies around time and HCI. Then, I will mention some limitations that supported framing my research aim. Last but not least, I will give brief closing remarks.

6.1 *Transferability of the Findings*

The findings of this dissertation aimed to open up further discussions where subjective perceptions of time become visible when the deadline is approaching, and multiple temporalities can be observed within the context. I aimed to understand how procrastination time is perceived and how HCI can learn by investigating similar cases. In this regard, in the future, I propose looking at the communities in which slowness or current time management tools may sometimes fail to address the challenges that humans are facing. To illustrate my argument, in light of the findings, offering slow technology as a solution (e.g., for reducing the time pressure) may not be the initial strategy for procrastination. Instead, understanding subjective temporalities and how design can expand the changes in the paces might be more suitable as a starting point. Deriving on this, the findings of this study can be transferred, contrasted, and can help the recent studies on the theorization of slowness (Odom et al., 2021) by adding the narrative of a self-defined pace. Further, it calls for exploring future case studies (e.g., older adults and their perceptions of pace (Karaoğlu & Subaşı, 2021)) where multiple temporalities are needed to be observed.

The 5 design insights can be applied in different contexts where deadline pressure becomes an issue. For example, we can envision cases where home and work are blended and where we can observe multiple responsibilities intersecting. In the future, it is foreseen that work and leisure will get even more intersected due to nomadic lifestyles and mass digitalization. These insights can also be applied to practical tools such as Google Calendar, Trello, Asana, Jira, and other time and project management tools to support a better time management experience.

6.2 *Limitations*

Before concluding this dissertation, I would like to mention a couple of limitations. The procrastination activities introduced in the online urban dictionary study are collected from fully anonymized entries. A single member usually describes the entries; the possible collective acts of procrastination are possibly not equally represented in the entries. I am also aware that the online urban dictionary entries are highly individualized and digitalized; however, to diversify this, I conducted interviews with self-identified procrastinators, which further helped me to contextualize desk-based

individual practices mentioned in the online urban dictionary. The privacy and confidentiality rules of the dictionary prevent us from further follow-up. I aimed to understand procrastination and its relation to time. I did not seek to understand procrastination from a behavioral perspective to develop solutions for it. My focus was to understand how time is perceived while procrastinating and what insights can be derived by adding the narrative of procrastination time. The design insights were aimed to inspire designers and future HCI studies that approach time management from alternative perspectives (e.g., looking into different time practices to discover new narratives of time (Lindley, 2015)). Therefore, the insights I shared in this dissertation are inspirational. The insights might show slight differences in a different study set up to understand procrastination time. While this study takes place outside of the US or European contexts, I have not observed anything that would be a limitation due to the study's geography.

6.3 Closing Remarks

Analyzing procrastination time revealed the complex relations between clock time, deadlines, and individual expectations from time. This dissertation contributed to the growing HCI and Time literature by adding a new narrative of time (procrastination) and its significance for designing the future of time management technologies for letting practices like procrastination and deadlines be met. While there is time pressure, it illustrates how individual coordination affects the perceptions of the universal and objectified understanding of time. Further, by adding this narrative and analyzing how it is expressed, I pinned down opportunities to support breaking the deadline and time pressures through five design insights. These insights aimed to broaden our thinking towards time and management of time in case when there is deadline pressure. I hope this study paves the way for new technologies to contest the objective structurization of time and support the broader HCI community in designing future time management technologies.

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Chapter 7:

APPENDIX 2: RELATED PUBLICATION

Time Perceptions as a Material for Designing New Representations of Time

Mert Yıldız

Aykut Coşkun

Abstract

Time is a growing topic of interest in HCI. Technological developments and changes in everyday life routines are creating new perceptions of time that are getting widespread in HCI. While these perceptions expand our current understanding of time, designing for them is an important yet an overlooked challenge. In this work, we investigated five time concepts from HCI literature (*right time*, *clock time*, *digital time*, *plastic time*, and *collective time*). We conducted a photography capturing task with four design researchers to understand how they interpret and perceive these time concepts. We then created two design speculations based on their perceptions and interpretations to illustrate how emerging time concepts can inspire new design ideas around representations of time.

Author Keywords

Time; Temporality; Perception of Time; Design Insights; Design Ideas; Interactive Systems; Design Speculations

CSS Concepts

• Human-centered computing~ Interaction Design; Empirical studies in interaction design

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Introduction

Time is an inevitable part of human existence. It influences the way we construct, shape, and manage our lives. In Western Societies, time is often regarded as universal, linear [13], and fast-paced [4] concept that is measured by abstract-numerical methods [8].

This understanding of time has been recently challenged and extended by HCI studies. Researchers have raised issues and identified future directions for studying time in HCI, particularly for designing interactive systems that examine alternative temporal scenarios [7,10,18]. For example, design artifacts such as *Oily* and *Slow Game* revealed how temporality can trigger long-term experiences and reminiscence by spreading the interaction over time [11]. *LUNE* [5] and *Takt* [2] experimented on visualizing time for rethinking our natural connections. Other researchers focused on revealing diverse understandings of time. They discovered new narratives of time by looking into aboriginal communities and their time management practices [17], examined new ways of valuing time by utilizing *Timebanking* to shift time as a currency [16], and identified new challenges for the normative notions of time, shifting the notion of time to a collective and entangled phenomena [6].

This growing body of work on time and HCI has led the emergence of new perceptions of time including "time as collective and entangled" [6], "time as socially coordinated" [13] "time as a slow-paced rhythm" [3,9], and "time as a subjective phenomenon" [13]. Although these perceptions are widening our current understanding of time, their potential as a design inspirational source for design is underexplored, i.e. how can we design with these various perceptions of

time and how they inspire new ideas around time and HCI. Addressing this gap, we conducted a two-phase study to explore how new perceptions of time are understood and interpreted by design researchers, and how their interpretations can be used to inspire new design ideas.

In the first part, we recruited four design researchers and gave them five key time concepts from HCI literature [6,17]. These concepts are "right time", "collective time", "digital time", "clock time" and "plastic time". We then asked them to take a photo that illustrates each concept along with a brief description of the photograph and its relation to the concepts. In the second part, based on the analysis of participants' photographs and their explanations, we devised two design speculations: *Experience Clock* (Figure 1), a tabletop clock that shows inter-connected everyday life experiences (e.g., having lunch, meeting with people), and *Disappearing Clock*, a regular clock whose numbers and hour-minute hands become invisible upon users' immersion into an experience (Figure 2).

Emerging Perceptions of Time in HCI

As stated above, we inspire from five new perceptions of time discussed in HCI literature [6, 13]. These concepts discuss the social and relational aspects of time, how they affect people's lifestyle and the fractured rhythms of everyday life. They uncover some problematic parts of universalized time understanding (e.g., the disconnection from our natural lifestyles with the emerging digital technologies). In the remainder of this section, we explain each concept in detail.



Figure 1: Experience Clock, Small Circle represents having a lunch and medium circle represents meeting with a friend. They both move to intersect with each other. When the center of the circles meet with each other, a blue area becomes visible to show that time flows accordingly. The user can see how much time has been spent on the inter-connected experience.



Figure 2: Disappearing Clock,

From top to bottom, as the user is getting immersed in a daily life experience, hour and minute hands of the clock starts to disappear. The clock visualizes the experience that is being lived, with an aim of enhancing it. It prioritizes lived experiences over the time spent on them by visualizing them through abstract shapes (e.g., blue color for being fun, green color for being relaxed at the same time).

Right Time

Proposed by Taylor et. al. [17], right time discusses that “understanding time in interface design not as a point on a calendar or clock, but as a set of converging circumstances that constitute “the time” for happenings to take place (p.1).” By conducting case studies with Aboriginal People, the authors propose that the combination of tangible (e.g., people) and intangible (e.g., energy) circumstances construct a “right time”.

Collective Time

In Making Time, Lindley et. al. [6] discusses time as a concept collected and entangled with our social relations. They explain that, fractures in people’s everyday routines lead to a perception of time as disconnected and personal. They further propose that time may be considered as collective, not necessarily spending time together but valuing the inter-personal connections in personal time intersections.

Plastic Time

Introduced by Rattenbury et. al. [14], plastic time is a concept that is often regarded as neither leisure nor work related time. It is unanticipated, un-reflexive and fluid (e.g., watching TV and skipping channels or checking social media accounts). In other words, with the growing interest of accelerated living and technology use, the empty time spaces in busyness create the concept of plastic time.

Clock Time

Clock time is a concept that is related with current timekeeping technologies [1,12]. It is a time concept that begins with the invention of clocks that shift humans’ lifestyles from their natural settings to

abstract connections with numbers (e.g., eating not when you are hungry but when the clock shows 12:00)

Digital Time

Explained in Tomlinson’s book [15], with the rise of the digital media, the notions of “being online” and “immediacy” created the concept of digital time. It is a time concept that feeds itself with the flow of information rather than our chronological time understanding.

Photography Capturing Study

We conducted the study with four design researchers since our goal is to introduce emerging time concepts found in the HCI literature to designers, by encouraging them to relate these concepts with their everyday experiences. We reached out them via our personal networks and later via snowballing. We first asked them to fill an A4 size paper template which explains each time concept in a few sentences. This template contains a space for designers’ photographs relevant for each time concept, and a place for explaining why a particular moment (photograph) is suitable for selected time concept. After 10 days, we collected the templates and conducted semi-structured interviews. We asked questions about the photographs, reasons behind capturing them, and how time concepts are perceived and interpreted by the participants.

Perceptions of Time Concepts

We gathered 20 photos and descriptions in total. Participants not only widened the scope of the concepts by adding new interpretations, but also emphasized under parts of the concepts. Next, we will explain how participants interpret each time concepts with example photos and descriptions.



Figure 3 (right time): Grandmother cooking a soup, checking for the right time to add ingredients, and coordinating them



Figure 4 (right time): Participant took this photo and mentioned spending time with the things she loves. “I barely cared about the actual time but rather it was the moment that I felt as by myself.”

Right Time

Participants found *right time* engaging and easy to perceive. They constructed *right time* as a time usually associated with coordination of things, observation of actions and senses, and tracking clues of daily life. For example, one participant mentioned of her grandmother’s cooking experience (Figure 3). She said “...there is no fixed-numeric time that can measure these; but the eyes, the nose and the textures tell the right time.”. Another participant modified the *right time* concept by calling it a *possible time*, where he can have flexibility in the daily life tasks (e.g., utilizing the time either for work or leisure). On another level, one participant said that (Figure 4), “it is me-time, where I can be as by myself and it’s a time that I wished it could freeze at that moment.” and utilized *right time* as an opportunity for self-reflection moment. Last participant observed her dog’s tail moves to understand whether it is the *right time* to take the dog out.



Figure 5 (collective time): A group of co-workers, celebrating New Year’s Eve by playing instruments and chatting with each other’s.

Collective Time

In *collective time*, participants focused on the meaning behind togetherness rather than just spending time

together. They mentioned concepts such as sharing experiences together, *collective understanding* of a knowledge, and being on the same page. For example, one participant called *collective time* as a *shared time* (Figure 5). She said, “However, once we can arrange such out of the ordinary events [referring to everyday lunch breaks], I believe that it becomes a shared time. We learn new things about each other and while doing so we forget about the time”. Another participant mentioned “two buddies in this photo seems to me as if they don’t have any idea about actual time but they share an experience together in which they have a mutual understanding and experience of time. And as a person who sees them, I am somehow coincide with that mutual time even if it is for a second.” (Figure 6).



Figure 6 (collective time): Two buddies sitting together at the rear of a seashore

Plastic Time

Participants found *plastic time* a challenging concept to capture and think of. They mostly assigned negative feelings towards this time concept. They pointed out the gaps in the time periods in daily life (e.g., waiting on the airport and not being able to do any leisure and work activity, Figure 7). They further called it as an



Figure 7 (plastic time): Participant waiting on the airport. She describes as, "I can't listen/read because there is too much going around me. I feel a bit on edge and try to be more aware of my surroundings."



Figure 8 (clock time): "In this photo, I wanted to demonstrate the psychological time of eating. Our constantly exposed time [referring to clock time], also affects our biological time. Eating before this hour is too early. If you go after too later than this time, it is late."

obligatory empty time because of the blurry time spent in daily life gaps (e.g., commuting to airport). However, one participant mentioned that this time needs to be filled with a meaningful activity like sleeping, learning, or reading a book.

Clock Time

According to participants, *clock time* was easy to capture since everyday life is revolving around it. However, in this concept, they questioned the reason behind living with numbers and clocks. They mentioned about how they are disconnected from the natural ways of living (e.g., Figure 8) and the problems of adjusting mind and body to clocks and forced routines (Figure 9). One participant criticized the current infrastructures of everyday work life as "We used to have winter-summer time adjustments to get the best of the daylight. But since this tradition have been abandoned, numbers that represent time are only placeholders, without what they used to represent."



Figure 9 (clock time): "This photo is taken at 08:03. The sun is yet to rise, it is only dawn. Whereas the day has already started due to our constructed clock time."

Digital Time

For the participants, *digital time* became a concept that is highly related with the time spent on digital technologies. While a participant mentioned *digital time* as an opportunity for exploration and improvement (Figure 10), another participant perceived it as a tool for connection (Figure 11). Moreover, they thought that, *digital time* sometimes helps to feel connected, showing presence and being able to respond to the situations.

Design Speculations Based on Perceptions of Time Concepts

We observed that participants revealed social and cultural aspects of time related to how we experience time differently in our daily lives. They indicated that current infrastructures of timekeeping technologies (clocks, numbers, schedules) may fail to deliver the experience behind everyday activities. They thought some of these technologies are superficial (e.g., disconnected hour problem in Figure 9), and fail to deliver immersive experiences in their lives. Moreover, as in the example of *collective time*, participants valued on the shared experiences. This showed the necessity of shifting our perspective about time from thinking it as a checkpoint between tasks (e.g., looking at the watch, and deciding to eat or socialize) to thinking it as a connect different everyday activities. Inspired from these findings, we speculated *Experience Clock*, where the clock shows lived and upcoming experiences in the daily life (Figure 1). It does not illustrate any numbers, but the user can see how the daily life experiences (e.g., going to lunch together or meeting with a friend for a coffee break) are getting connected throughout the day. When the circles' centers get in a straight line, *Experience Clock* shows that, relations between these



Figure 10 (digital time): "For me, digital time is a time period where it enables us to use technology efficiently and purposefully. It is not only watching tv series. Here I am learning coding as a part of having a leisure."

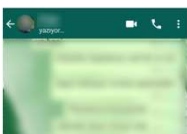


Figure 11 (digital time): "Typing...". Even though my friend is in the US, we are online at the same time- in different time zones. When I see online and especially the 'typing' notification, I feel very connected to and present with the person on the other line.

experiences have been achieved (as mentioned in the *Collective Time*, Figure 5), and the time flows accordingly. Further, users can interact with the clock by adding or removing circles that represent new everyday life experiences.

As mentioned by several participants, the numbers and minutes became pointless when they are immersed in an everyday experience e.g., celebrating New Year's Eve with friends (Figure 5) or having self-reflection moment in a nice environment (figure 4). However, they pointed out the necessity of enriching interactions through timekeeping technologies while having these daily life experiences. In some cases, they did not pay attention whether a clock is there but emphasized different ways of interacting with the clock. In this regard, we speculated *Disappearing Clock* (Figure 2) which slowly obscures hour and minute hand as participants are immersed in a personal (right time, figure 4) or shared (collective time, figure 6) experience. This speculation aims to prioritize lived experiences over the time spent on them by visualizing them through abstract shapes (e.g., blue color for having fun, green color for being relaxed at the same time and orange color for self-reflection in the same experience).

Conclusion and Future Work

In this paper, we shared the initial findings of an ongoing user study about various perceptions of emerging time concepts and how they can inspire new concepts. Even though we gave the participants definitions of time concepts, they came up with their own interpretations and definitions of these concepts. This showed that time is a subjective phenomenon, and that designing interactions and representations for

subjective time experiences are needed. Moreover, the participants even questioned already existing time concepts in their lives (*clock time*). Based on these subjective interpretations, we created two design speculations: *Experience Clock* and *Disappearing Clock*. The purpose of these speculations is not to provide the best solution for representing time; rather, they aim to raise new questions around time in HCI that trigger debate and future research. Thus, in the scope of future work, we plan to explore: in which alternative worlds would these speculations be meaningful? would these alternative worlds interpret the time in the same way as our present world? What kinds of social relationships can exist for these speculations to make sense as consumer products in alternative worlds?

As for the methodology, we found that, five time concepts enhanced participants' understanding of time and helped them to get familiarized with the concepts. In this regard, photography capturing task became an effective tool for working on these kinds of abstract topics. Furthermore, the photography capturing task requires thinking reflectively on abstract concepts and relating these concepts with concrete things in everyday life. Since design researchers are typically trained in reflective thinking and used it frequently in their work practices (Schön, 1983), we chose to recruit design researchers in this preliminary study. In the scope of future work, we plan to use the method with participants having different backgrounds to explore more personal interpretations of time.

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Chapter 8:

APPENDIX 3: IRRATIONAL PROCRASTINATION SCALE**Procrastination Ölçüm Örneđi****Not: Soru 2,5 ve 8 ters sıra ile notlandırılacaktır.**

1. Yapmam gerekenleri, makul olanın ötesinde geciktirim.	1	2	3	4	5
2. Her şeyi, yapılması gerektiđine inandığımda yaparım.	5	4	3	2	1
3. Yapmam gerekenlere daha erken başlayamadığım için sık sık pişmanlık duyarım.	1	2	3	4	5
4. Yapmamam gerektiđini biliyorum ama hayatımın ertelediğim tarafları var.	1	2	3	4	5
5. Yapmam gereken bir şey varsa, daha ufak şeylere başlamadan önce ona ulaşırım.	5	4	3	2	1
6. İşleri o kadar uzun süre ertelerim ki, verimliliğim veya iyi oluşum gereksiz yere acı çeker.	1	2	3	4	5
7. Günün sonunda, zamanı daha iyi geçirebileceğimi biliyordum.	1	2	3	4	5
8. Zamanımı akıllıca harcarım.	5	4	3	2	1
9. Bir şey yapmam gerekiyor olduğunda, başka bir şey yapacağım.	1	2	3	4	5

Toplam Skor:

19 veya aşağısı	Alt 10%'luk dilimdesiniz	Sizin sloganınız: "her şey sırasıyla"
20–23	Alt 10–25%'lik dilimdesiniz	
24–31	Orta 50%'lik dilimdesiniz	Ortalama "Procrastinator"
32–36	Üst 10–25%'lik dilimdesiniz	
37 ve daha fazlası	Üst 10%'luk dilimdesiniz	"Yarın" sizin göbek adınız.

Chapter 9:

APPENDIX 4: GÖNÜLLÜ ERTELEME ZAMANI ÇAĞRI İLANI

**Gonullu Erteleme (Procrastination*)
Zamanını Tasarlamak**

**Procrastination: (isim), erteleme, geciktirme,
ağırdan alma, öteleme*



Çalışmamıza katılmak için:
bit.ly/gonulluerteleme

Chapter 10: APPENDIX 5: GÖNÜLLÜ ERTELEME ZAMANI RÖPORTAJ SORULARI

Erteleme (Procrastination) Röportaj Soruları

- Tanımlayıcı Sorular
 - o İsim-Soy isim
 - o Yaş
 - o Meslek

Bize erteleme (procrastination) yaptığınız zamanla ilgili bir anınızı paylaşır mısınız?

En son ne zaman "ah şimdi erteleme (procrastination) yapıyorum" dediniz, biraz bahsedebilir misiniz?

- İş ve Eğlence arasında erteleme (procrastination) davranışının nasıl yaşandığı, algılandığı ve tanımlandığını anlamaya yönelik sorular
 - o Procrastination hakkında konuştuğumuz zaman, siz "procrastination"u iş ve eğlence çerçevesinde nasıl tanımlarsınız?
 - Procrastination günlük hayatınızın hangi kısmına veya kısımlarına dahil olmaktadır? Siz procrastination'u nasıl kurguluyorsunuz örneğin: özel bir yetenek mi? hastalık mı? Alışkanlık mı? Vs.
 - o Sizce procrastination günlük hayatta neden gerçekleşiyor?
- "Procrastination Zamanı"nı keşfetmek
 - o "Procrastination zamanı" dediğim zaman bu siz bu zaman dilimini nasıl tanımlarsınız?
 - o Procrastination zamanınızı nasıl değerlendiriyorsunuz?
 - Neler yapıyorsunuz?
 - Bu yaptıklarınızı neden procrastination olarak değerlendiriyorsunuz?
 - o Ne zaman procrastination yapıyorsunuz?
 - Neden sizce bu zamanlar ve yerler procrastination için ideal oluyor?
 - o İş ve eğlence zamanlarını nasıl tanımlıyorsunuz?
 - Sizce procrastination'un bunlarla ilişkisi ne olabilir?

Analizindeki Bulgularla Örtüşen Sorular

- Procrastination'a karşı Tavırlar
 - o Bazı insanlar procrastination'u olumlu veya olumsuz değerlendiriyor (*iyi örnekleri promote et ortada kalırsa*). Sizce ne zaman ve neden insanlar procrastination'ı olumsuz veya olumlu değerlendiriyor?
- Procrastination Objeleri
 - o Procrastination'a başladığınız bir anı tanımlayabilir misiniz? Genellikle nerede oluyor... neden orada oluyor, çevrenizdeki objeler veya yerler nasıl etkiliyor? Etkileşim.
- Procrastination'un Boyutları
 - o Tam procrastination yapıyorum dediğiniz anlar ne zaman gerçekleşiyor?
 - Nasıl, ne zaman ve nerede bu anlar oluyor?
 - Bu anları oluşturan şeyler sizce neler oluyor?

- Tetikleyen başka olaylar var mı sizce? (events, people, environment, objects, ... // hidden checklist)
- **Procrastination Zamanının idaresi (yol açıcı/bloke edici/ yeteneğe dönüşmesi)**
 - o Procrastination zamanınızı nasıl yönetiyorsunuz? Neler yapıyorsunuz bu zaman diliminde?
 - Procrastination zamanınızda yaptıklarınız, iş ve eğlence zamanınızı nasıl etkiliyor?
 - Ne zaman duruyorsunuz?
 - Durmaya nasıl karar veriyorsunuz?
 - Geçişler_wlp
- **Procrastination'un Sonuçları**
 - o Procrastination'ın bittiğiniz düşündüğünüzde nasıl hissediyorsunuz?
 - Neden böyle hissediyorsunuz?
 - Procrastination'ın sonuçlarını günlük hayatınızı nasıl etkiliyor?

Tasarım Çözümleri Geliştirmeye Yönelik Sorular

- Procrastination zamanınızı geliştirmeye veya göz ardı etmeye yönelik stratejileriniz nasıl şekilleniyor?
- Procrastination zamanınızı nasıl anlamlı hale getiriyorsunuz, stratejileriniz nelerdir?
- Zaman planlaması ile olan deneyimlerinizden bahsedebilir misiniz? Ne gibi destek kullanıyorsunuz?