Is Your Time Well Spent? Reflecting on Knowledge Work More Holistically

by

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The following individuals certify that they have read, and recommend to the Faculty of Graduate and Postdoctoral Studies for acceptance, the thesis entitled:

Is Your Time Well Spent? Reflecting on Knowledge Work More Holistically

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Abstract

The modern workplace is more demanding than ever before. Yet, since the industrial age, productivity measures have predominantly stayed narrowly focused on the output of the work, and not accounted for the big shift in the cognitive demands placed on the workers or the interleaving of work and life that is so common today. We posit that a more holistic conceptualization of Time Well Spent (TWS) at work could mitigate this issue. In our 1-week study, 40 knowledge workers used the experience sampling method (ESM) to rate their TWS and then define TWS at the end of the week. We found this rating was heavily dependent on physical and emotional state for some. Thus we ran a 4-week study (n=22) with an intervention inspired by Cognitive Behavioural Therapy, and we found that, relative to the control group, our ESM-based intervention shaped participants' personal concept of TWS, especially by giving some participants awareness of the impact of their feelings during and towards work. Our work contributes a preliminary characterization of TWS, empirical evidence that this term can capture a more holistic notion of work that also includes the worker's feelings and well-being, and design implications for future tracking tools that support knowledge workers.

Lay Summary

In today's workplace, performance is often measured using the notion of productivity. However, many occupations now involve solving complex problems, and output-based productivity alone is a poor measurement for work success. In this thesis, we explore using a new term, Time Well Spent, in order to capture both time management and well-being during the workday. In our initial 1-week study, 40 participants used online hourly surveys to rate their TWS. We found this rating was heavily dependent on physical and emotional state for some. Thus we ran a 4-week study with an intervention inspired by Cognitive Behavioural Therapy, self-reflection using a mobile application that prompted users to log their feelings and activities hourly. Compared to the control group, our intervention gave some participants awareness of the impact of their feelings during and towards work. This work is a preliminary effort to create holistic time management software for knowledge workers.

Preface

The experiments described in this thesis were conducted with the approval of the University of British Columbia Behavioural Research Ethics Board (certificate number H18-01774).

Parts of this thesis appear in a conference paper manuscript, where I am the first author ¹. I was the lead investigator for the studies, responsible for all major areas of concept formation, data collection and analysis, as well as manuscript composition and participant recruitment. Graduate student Kevin Chow helped in deploying, conducting, and analyzing the second study, as well as manuscript composition. Joanna McGrenere and Thomas Fritz were the supervisory authors on this project and were involved throughout the project from concept formation to manuscript composition.

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Dedication

To Nik

Chapter 1

Introduction

In this age of information, knowledge workers have higher demands than ever before. Industrial workers often had clearly defined and somewhat repetitive tasks that were performed in a defined workday while largely disconnected from the outside world. In contrast, today's workers, most notably knowledge workers, often have flexible hours and autonomy to perform a broad variety of cognitively demanding tasks. The always-connected nature of technology has fuelled both an interleaving of work and life and an increase in interruptions and distractions at work. These changes to work and the digitization of it have been accompanied by an increase in mental health problems [4, 61], so much so that the World Health Organization is raising concerns over workers' mental health. Yet, despite these radical changes, knowledge workers are often still assessed using classic productivity measures that narrowly focus on the output of their work [50], such as the number of tasks completed, that do not take into account the overall well-being of the worker.

There is a breadth of research that investigates worker productivity in the digital age, but it predominantly focuses separately on either productivity or specific aspects of well-being [12, 31, 49]. For instance, the factors that influence employee productivity have been examined in organizational productivity research (see [23] for a review). More recently in Human Computer Interaction (HCI) research, knowledge workers' assessment of perceived productivity has been characterized [31]. There are studies that capture emotions during work [35, 37, 40], but none are focused on having individuals themselves explore the effect of emotions on their work and well-being, and vice versa. Other research has devised and examined approaches to foster productivity. For example, by reducing digital distractions, to lower stress through interventions, or by providing technology for self-monitoring for productivity (e.g. [29]) or emotions at work (e.g. [44]). One such study showed specifically that technology interventions to reduce distractions in fact significantly increased some workers' stress [42].

What is missing from the literature, as well as technology interventions in the marketplace (e.g. RescueTime [53]), is a more holistic approach, one that combines classic productivity with well-being, to capture more fully how knowledge workers are doing. We posit that such a holistic approach could be incorporated into the design of digital tools that more effectively support workers. This is our long-term research objective.

The goal of the work in this thesis is to investigate whether we can foster more holistic thinking about a knowledge worker's time at work. By focusing on the notion of "Time Well Spent" (TWS) at work—a term that has also recently appeared in popular media [22]—we hope to capture actions that are both productivity-related and those that are targeted at well-being, as well as workers' perceptions and emotions.

As an initial step to examine whether the concept of TWS can foster a more holistic thinking about knowledge work, we performed two studies. First, we conducted a one-week study using the experience sampling method (ESM) to investigate whether using the term TWS helps to capture a more holistic notion during primary working hours. We recruited 40 participants and collected their personal definitions of the term TWS and experience samples where they rated the degree to which their time was well spent. Our findings show that people characterize TWS in terms of what they work on, how they work, how they feel, and how they take care of themselves. Importantly, we show that the term Time Well Spent evokes a strong theme of Self Care. Additionally, some participants who reflected on both activities and emotions changed their perception of their work.

In a second step, we designed and ran a four-week study with 22 participants, using our experience sampling influenced by Cognitive Behavioural Therapy (CBT), to examine whether reflecting on TWS could shift a worker's awareness—a crucial step in behaviour change [51]—towards a more holistic view of their work. Our findings show that, relative to the control group, our ESM-based intervention shaped participants' personal concept of TWS, especially by giving some participants awareness of the interaction of their feelings and work.

This thesis contributes a preliminary characterization of TWS and empirical evidence that this term can capture a holistic notion of work. We show that when knowledge workers reflect on TWS during working hours the importance of self care and how one feels is emphasized. Furthermore, we contribute an empirical understanding of the impact of our CBT-inspired ESM intervention and offer concrete ideas for future work with an ESM intervention that will more explicitly capture the emotional component of work using TWS.

Chapter 2

Related Work

We begin by discussing productivity as the current performance metric for work and review the limitations of current self-monitoring technologies that promote productive work. We then discuss stress in the workplace, how health behaviours are being tracked, and Cognitive Behavioural Therapy

2.1 Productivity and Self-Tracking

Productivity is the primary work performance measure today, but this term is becoming harder to define as a majority of the workforce has gone from labourers with relatively straight-forward inputs and tangible outputs to creative knowledge workers with domain specific and hard-to-quantify outputs. Research has identified a variety of factors that influence productivity for knowledge workers. These factors include organizational ones, such as team dynamics [10], feedback [17], autonomy [17, 56], and office environments [12, 24]. At the same time, there are various personal factors that influence workers' productivity, such as intrinsic motivation [21], psychological well-being [12, 57, 62], and work engagement [7, 63].

The HCI community has been targeting several of these productivity factors in today's technology-rich work environments. For instance, researchers extensively studied the nature of distractions/interruptions and devised approaches to lower their burden on productivity [9, 15, 16, 27, 36, 41, 42]. However, a concern with some productivity enhancing methods is that they can cause an increase in stress,

for example, by negatively framing productivity [29] or by blocking distractions for individuals who were already focused at work [42].

There is also a growing body of HCI research that focuses on quantifying aspects of work and promoting more productive work behaviors by the use of selfmonitoring techniques. Most of the existing self-monitoring software tools use automated tracking to determine productivity and focus on the time spent in computer applications [29, 53, 59]. While this reduces the burden of data collection for the user, only capturing the activity (such as website or application in use) and duration may fail to recognize the context of the activity and even if the activity was related to work, it cannot accurately judge whether this time was spent efficiently. Also, automated tracking can only detect activities on the system where the software is installed, so real-life activities, such as face-to-face conversations or impromptu meetings, are not captured. Researchers have therefore suggested design recommendations for self-monitoring in the workplace that include experience sampling to provide richer insights on productivity [47].

Recently there has been a slight shift to examining productivity more holistically. Meyer et al. has classified what makes a day "good" or "typical" for software developers in terms of productivity, but this was based on one end-of-day survey [45]. This work expanded on previous work by Meyer et al. that comprised a survey as well as four-hour observations and interviews with professional software developers to better understand their perceptions of productivity [46]. Further, a recent classification of personal productivity for knowledge workers shows early evidence that emotional or physical state can influence perceived productivity [31].

Instead of strictly aiming to measure and increase productivity, we posit that TWS is a step towards an alternative, holistic evaluation that could eventually become a standardized measure of performance for knowledge workers. In order for participants to deeply reflect on their personal concept of Time Well Spent, they need to reflect on *all* the activities they do during a day and have a sense of whether or not they spent that time well. Further, since it's not currently possible to have an automatic summary of activities and reflections, we set out to collect self-reported experience samples.

2.2 Stress and Emotions

Stress is a part of life for many adults, especially in the workplace and for today's students. A 2019 survey by the American Psychological Association found that 64% of adults identify work as a major source of stress [6]. North American surveys in 2019 found that 60.9% of undergraduate students and 64.5% of graduate students described their overall level of stress 'more than average' or 'tremendous' during the last year [2, 3]. In our second study, we limited participants to graduate students to homogenize the type of work and to capture this higher level of stress across participants. In the HCI community, stress has been addressed in many aspects of knowledge work, such as multitasking [37], email [40], and distractions [42]. More generally, emotions directly influence how we perform everyday tasks, interact with others, learn, work, and make important decisions [34]. Negative emotions are known to affect our physical and mental well-being, and a higher positive affect balance has been correlated with higher productivity [38]. Since worker mental well-being influences performance and productivity, there is an effort to combat mental health concerns.

2.3 Interactive Technologies for Health and Well-Being

Beyond tracking work behaviours, self-monitoring technologies are used for a variety of health behaviours including tracking physical activity [13, 14, 19, 33], emotional states [44], stress [39, 40], sleep [28], and diet [20]. The goal of these technologies is to increase self-awareness which, according to the Transtheoretical Model, may eventually lead to behaviour change [51]. Our long-term goal is to extend these tracking tools and incorporate a more holistic thinking about time at work in order to build awareness and hopefully lead to behaviours that balance productivity and well-being.

The Transtheoretical Model [51] is a well-established theory of the process of behaviour change and describes behavior change as a sequence of stages which are run through until a behaviour change happens and can be maintained. Selfawareness is a process that allows advancement between stages, especially from being unaware of the problem behavior (precontemplation stage) to acknowledging it is a problem and intending to improve it (contemplation stage). Self-monitoring tools have been shown to assist users through these stages (e.g. [33]) revealing underlying causes of problematic behaviour, encouraging the behaviour to change to a more positive one, and helping maintain and monitor the behavior change.

2.4 Cognitive Behavioural Therapy

Cognitive Behavioural Therapy (CBT) is based on the simple concept that in every situation one experiences, their thoughts, feelings, and behaviours are interacting and influencing each other. The goal of CBT is to develop skills used to manage difficult situations, feelings of distress, and problematic thoughts and behaviours [54]. For example, imagine someone sees a dog. If they are afraid of dogs, then their thought might be "That dog will bite me!", then they might feel afraid and run away. If they like dogs, then their thought might be "What a nice dog!" and they might feel happy and pet the dog. Notice in these two examples that the situation is the same, but a difference in thoughts resulted in different feelings and actions [5]. Since thoughts, feelings, and behaviours influence each other, changing one of these can lead to changes in the other two. CBT uses a method that works on changing undesirable outcomes into desirable ones in this way, especially by having individuals record their experiences in order to keep a trustworthy record for recognizing their patterns and progress. In our work, we explore reflection on emotion as a part of regular time management instead of a therapeutic treatment.

Online CBT, standardized CBT treatment that the participant works through independently on the internet, has been used for treating depression and anxiety [18, 32, 52] and these interventions have shown promising results by promoting engagement through conversational agents and relatable examples. For disordered eating, real-time self-monitoring helps patients be more aware of momentary thoughts and feelings so that they can begin to change behaviours that seemed beyond their control [48]. We found these self-monitoring approaches to be similar to current productivity tracking strategies, but with an emotional aspect included. In our work we create a CBT-inspired self monitoring technique using experience sampling that combines the emotional reflection aspect of CBT with the behaviour tracking aspect of productivity tracking. As shown with other self-monitoring tools, awareness is a first step to behaviour change. Increasing awareness is our goal for this work.

Chapter 3

Study 1: Capturing Holistic Thinking

The main goal of our study was to examine whether the concept of TWS can capture holistic thinking about knowledge work. Ultimately, we wanted participants to answer the question 'What is Time Well Spent?'. However, from piloting, this concept was too difficult for participants to come up with a thoughtful answer when reflecting abstractly. To have participants deeply reflect on the concept and produce a thoughtful personal definition of TWS, we performed a multi-day experience sampling study instead of a single survey or interview.

3.1 Method

3.1.1 Participants

We recruited 40 workers (21/19 M/F; ages 22-50, M = 28.2, SD = 5.71) through word-of-mouth and an online public study posting board at a local university. They worked in 13 different positions: actuarial analyst (1), archaeologist (1), administration/assistants (7), engineers (3), financial analysts (2), grad students (10), managers (4), marketing strategists (1), researchers (3), salespeople (2), social worker (1), software developers (4), and writer (1). We limited the number of participants from any one field to 10. The inclusion criteria was that they worked full-time with at least 6 hours per working day, the majority of that time was spent using technology, and the individual must have some autonomy on the tasks they choose to perform throughout the day. Participants gave informed consent and were compensated with a \$40 CAD gift card.

3.1.2 Procedure



Figure 3.1: A timeline of our procedure for Study 1.

Our main objective in the study procedure was to collect personal definitions of the concept of TWS. Therefore, we asked participants in a TWS survey "*Over the past workweek, you have been reflecting on how you have been spending your time. How would you define 'Time Well Spent'?*" In designing the procedure for this study, we found we had to add reflective in-situ activities for participants because we wanted them to think about the concept of TWS and about whether their time was well spent or not over a period of time. While this reflection and in-situ data collection of activities during primary working hours took up a majority of the study, our main goal was for this to prompt participants to provide a thoughtful definition of the concept of TWS. To reinforce the holistic nature of this study, we did not mention the term 'productivity' at any point. Whenever the term was mentioned by participants in the survey responses, it came from them without prompting.

Overall, the study consisted of an initial survey, 5 days of hourly experience samples and daily end-of-day experience samples, the TWS survey, and a follow-up survey (see Figure 3.1 for a timeline of these steps). Supporting material for this study can be found in Appendix A. In the initial survey, participants set up the experience sampling parameters, which included the days of their work week, the time of day they should begin receiving notifications in order to complete at least 4 experience sampling surveys each day, and whether they wanted to receive



Figure 3.2: Five (1, 3, 5, 7, and 9) of the nine faces in the Likert scale, lined up with their position on the slider. In the survey, participants saw one face and the shape of the mouth changed with the slider.

reminders by text message or email.

For the 5 days of hourly experience samples, participants were asked to complete an online experience sample survey every working hour. Each survey prompted the respondent to "*Please reflect on the time since your last survey, or since the beginning of your workday. What personal and work activities did you engage in?*". We provided a list of examples to reinforce that we wanted them to reflect on all activities, including non-work activities such as breaks, face-to-face or online communication, interruptions, or any other personal activity. We then asked 3 questions: (Q1) "How do you feel about how well you have spent your time?" This was rated on a 9-point Likert scale with a neutral face at 5, frowns below 5, and smiles above 5 (see Figure 3.2). We found that pilots responded better to these faces than numbers or 'how well' descriptions; (Q2) "Why do you feel this way?" Open response; (Q3) "How did you spend your time?" Open response.

In addition, we asked participants to complete an end-of-day survey to rate their day as a whole and note whether it was a typical day or not and why. They also received a text message or email at the end of the day, letting them know how many days of tracking they had left to complete. The experience sampling finished when the participant had completed 5 days of surveys (at least 4 completed surveys per day).

In the TWS survey, at the end, we asked participants for their personal definition of the concept of TWS: Over the past workweek, you have been reflecting on how you have been spending your time. How would you define 'time well spent'?. Additionally, we asked about participants' own characterization of their workplace environment and demographics. After two weeks, we sent optional informal follow-up emails asking about the experience of the study and the impact of the reflection itself.

3.1.3 Data Collection and Analysis

For the experience samples, we sent participants a text message or email notification every hour. For sending the notification, we created a simple Python messaging server using Python's smtplib module [55] and Twilio [58], a communication API. To capture the samples we used Qualtrics surveys. For the initial and TWS survey we also used Qualtrics.

The 40 participants each provided a final definition of TWS. To analyse and code these 40 definitions, we performed a two-step process involving three researchers. First, to inform the final coding of the definitions, One researcher and I chose a random subset of 300 of the collected experience samples and independently coded them for explanations of the ratings following a thematic analysis approach [11]. The codes were discussed and consolidated, and saturation was reached. Second, another researcher and I then used the previously identified codes as a basis for coding the 40 TWS definitions. For this coding, we used thematic analysis and independently coded a subset of the definitions (20 entries; 50%) and discussed them. This step served to refine the original set of codes, mostly their descriptions, and to generate 4 higher-level themes (the final themes are outlined in Section 3.2.2). Most TWS definitions were multi-coded as they touched on more than one theme. The full set of 40 were coded by myself after the agreement was reached.

After coding the TWS definitions, I went back and coded all 1149 hourly surveys to validate the identified high-level themes of TWS and to assess whether experience sample explanations of TWS ratings were work and results-focused or focused on the state and well-being of the participant.

3.2 Results

We report the study results in three parts: descriptive statistics of the experience sampling, characterization of personal definitions of TWS, and insights from the hourly self-reports.

3.2.1 Descriptive Statistics

We collected 1321 experience samples (1149 hourly surveys, 172 end-of-day surveys) from 40 participants (average of 33.0 per participant). The participants were required to complete 5 days with at least 4 surveys completed. On average, the study took 5.5 unique working days spanning an average 8.7 calendar days, per participant. The definitions of TWS collected in the TWS survey ranged in length from 3 to 90 words (M = 28.7, SD = 20.2).

3.2.2 Characterizing TWS During Primary Working Hours

From the 40 TWS definitions we identified 15 subthemes of TWS and grouped these under 4 larger themes (our code book table can be found in Appendix A.5). Figure 3.3 shows that the distribution of these codes differed for each participant. We next discuss the themes and subthemes.

What I work on. Since we asked about TWS during primary working hours, it is not surprising that 32/40 definitions had a results-focused dimension of work. We found that some participants valued progress, while others valued completion of tasks or a mix of both. Participants who listed progress as an important component of TWS often talked about their progress in the context of a larger goal, e.g. "I consider time to be managed well when I have finished all the tasks I had on my to-do list by the end of the day. I create my to-do list based on larger projects, so that means I'm closer to completing my long-term goals everyday." (P34). They felt their time was better spent on tasks that push them towards finishing a larger project than menial day-to-day tasks or unrelated administrative work. Completion of tasks was usually in regards to tasks that could be completed in one day rather than a larger project. On a similar note, many participants also recognized that they followed either a long-term or short-term plan and that their time is well spent when they work according to this plan. Participants also cared about the quality of work they performed. They explicitly stated that their time is well spent when they are doing their best work and producing high quality results, e.g. "providing quality customer service" (P39).

How I work. The subthemes of punctuality, efficiency, and mental focus describe the person-focused working behaviour valued by 13 out of 40 participants.



Figure 3.3: Participants (n=40) each gave a definition of TWS, which is represented by a line. It could be multi-faceted in terms of touching multiple major themes (multiple circles across the line) and multiple subthemes within a theme (size of the circle). The number at the bottom gives the total number of participants (out of 40) who touched on the corresponding major theme.

For **punctuality**, participants mentioned both external deadlines ("*Meeting my deadlines and staying on top of my paperwork*." (P25)) and self-imposed requirements ("*Getting tasks done in a timely manner*" (P10)). Efficiency-focused participants were concerned about using time as efficiently as possible. This is different, but not mutually exclusive from valuing **mental focus**, staying focused on a task for long, uninterrupted periods of time and avoiding distractions. For example, P5

defines TWS as "time spent focused and attentive to my work".

How I feel. 11/40 definitions captured some aspect of feelings, expressed in the form of a sense of satisfaction or achievement, the feeling of doing something meaningful or fun, or the avoidance of feeling guilt about how they spent their time. Those expressing **satisfaction or achievement** talked about satisfaction in the work they produced or the way they worked. For example, P9 defined TWS as time "*when I felt satisfied that I used my abilities adequately*". Recognizing **meaningful and fun** meant valuing the importance or enjoyment of the work itself. For example, P1 felt time was well spent when the tasks were worth their attention, e.g. "*I would define it as time spent on things/tasks that I feel are worth my attention.*", and P21 listed "*having fun*" as one component of their definition.

How I take care of myself. 17/40 definitions mentioned activities that are not specifically work related. These fell into 4 major categories: physical health, mental and emotional health, social bonds, and breaks from work. During primary working hours, many participants felt it was important to pay attention to their **physical health** by doing things like eating, moving, or napping, e.g. "Accomplishing many tasks, bonding with co-workers, or getting mid-day breaks to move and walk" (P6). Some participants prioritized their **mental and emotional health** and noted that taking time to care of this aspect of their health was important and well spent. Maintaining relationships and **social bonds** was also important for many participants, in their personal life but many also explicitly valued nurturing social bonds with colleagues. For example, P19 explains "time spent socializing is also enriching, as long as it doesn't take up too large a portion of a workday." Well-placed, or short.

3.2.3 Hourly Reflections on TWS

While the main focus of this study was to collect personal definitions of the concept of TWS, we also analyzed the 1149 hourly experience sample answers to the question *Why do you feel this way?* to determine whether participants explain their rating using work and results-focused language (*What I work on* and *How I work*) or using well-being and emotionally-driven language (*How I feel* and *How I take*

care of myself).

Similar to the TWS survey responses, the majority of the hourly experience samples (955 of 1149) focused on the work output and how the participant worked. These samples further supported our identified themes and subthemes and captured all dimensions of 'What I work on', e.g. "Accomplished tasks that needed to get done. Tasks were not demanding." (P2), "Got my code working." (P7), all the way to the ones of the 'How I work' theme, for instance with a participant stating "I was working throughout the whole hour with almost no distractions on an important task I know I had to get done, and got the code to work." (P32).

Also in line with the TWS analysis, there were a notable number of samples (265/1149) that also captured the 'How I feel' and 'How I take care of myself' theme. Some examples of emotionally-driven answers include "I am really proud of myself for staying on task" (P31), "I was angry because I did a job from another department" (P23), and "felt good to be needed and to have valuable input" (P4), while explanations using physical state included "I felt tired and exhausted at the end of the day!" (P17), "not physically feeling as great today" (P38), and "Felt energized even though it was Monday morning" (P30). It is not surprising that most explanations for rating TWS were based on results-focused work since we were polling during the work day; many of the entries that mentioned emotional or physical state also mentioned work. Importantly, there is notable variation in the total number of emotional or physical state-based explanations between participants. The total number of these entries per participant ranged from 0 to 18 (M = 6.63, SD = 5.07) and the total percentage of these entries per participant ranged from 0% to 85% (M = 18.92%, SD = 24.08%). This suggests substantive individual differences among participants in terms of the emphasis on emotional and physical state as a component of TWS.

3.2.4 Impact of the Experience Sampling

Based on informal conversations with participants directly afterwards, we were given the impression that some participants were affected by the act of recording the hourly reflections. Thus, two weeks after the study finished we sent optional feedback emails asking *"In what way, if at all, was reflecting on Time Well Spent*

helpful or unhelpful?" We received 15 responses and found that 3 participants who had already been satisfied with the way they spent their time during primary working hours did not find the act of self-reflection every hour in this study to be helpful, rather they found it to be "tedious" (P3) and "interruptive" (P1). Meanwhile, there were 7/15 participants who reported changing their feelings towards work because of the reflection and 6/7 of these participants gave at least 25% emotion-based explanations for their TWS ratings. For example, one participant felt guilty he was taking too much time during the workday to talk with his long-distance partner (necessitated by the time difference), but during the study he realized this social and emotional connection was important for his ability to work and that he was working enough atypical hours to not feel guilty anymore. Another participant noted "after my week long survey with this study, I was cheery to realize that I feel 'mildly happy' during most of my work hours and I wasn't as depressed as I thought I was." (P39). 5/15 participants were neutral towards the study. They did not find it annoying, but they only gained small insights and would not use the tool in the future.

3.3 Discussion

We have made progress at capturing a more holistic concept of work. We found that by using the term Time Well Spent, knowledge workers think more holistically about their work, combining traditional productivity-related concepts with well-being. In recent and the most closely related work, Kim et al. have already shown that 'productivity' is a multifaceted concept and provide early evidence that emotional or physical state can influence perceived productivity [31]. With 'Time Well Spent' we introduce a different concept that encompasses productivity dimensions, yet captures a more personal assessment of how one spends one's time against one's values, and is not limited to any defined set of activities. More specifically, our thematic classification showed that TWS: (1) introduces a strong theme of Self Care (acknowledged by 17/40 participants); and (2) relative to [31], significantly emphasizes the theme of Emotions and feelings (in 11/40 definitions). Our frequency counts illustrate the pervasiveness of these well-being-related aspects. Especially in today's knowledge work environments in which mental health con-

cerns come more into the fore, the more holistic concept of TWS can provide many benefits, for example, for assessing one's work.

To examine TWS at work and gather thoughtful and well-reflected definitions of it, we used a method that differed from other studies, such as the one by [31], in key ways. To have participants deeply reflect on their work and the TWS concept, we first had participants self-reflect on it for a 5 day period, asking them to log all activities during primary working hours, asked for a TWS (Likert) rating of it and an explanation of their rating. Only after the 5 day reflection period, we asked participants for their personal definitions of TWS. In comparison, Kim et al. [31] focused on productivity in work and life by having participants log "productive activities" during all hours and asking how productive the activity was and for an explanation, rather than thinking more holistically about work and TWS during working hours. Our piloting demonstrated how valuable this additional period and holistic self-reporting was for participants to come up with a thoughtful answer when reflecting abstractly.

We posit that the use of reflection on TWS can provide benefits to knowledge workers that go beyond an awareness change of productivity at work and generally lead to a healthier and more emotionally-aware workforce. Self-monitoring and reflection have already been shown to provide benefits for certain areas, especially in the health domain (e.g., [13]), and also for productivity (e.g., [31]). In our study, we saw preliminary evidence that some participants who reflected on TWS had changes in their awareness and perception of their work, such as feeling less guilty and happier, a first step in behaviour change [51]. However, frequent selfreports and explicit reflection on emotions can also be seen as tedious and have negative effects for some individuals. Consistent awareness of negative emotions may highlight these and make the individual feel worse. As seen in [42], individuals who already have high self-control may feel more stressed by reflecting on activities throughout the day. In our follow-up, we found that participants who already felt satisfied with the way their time is spent at work were concerned that a tracking tool would make them feel worse about work. On the other hand, for participants that started the study off dissatisfied with the way they spent their time, the self-reflection appeared to be more helpful. In future work when designing an intervention, it will be important to take into account the satisfaction of participants

with their work and pay attention to negative feelings.

Our preliminary evidence of reflection on actions and feelings causing a change in thoughts has led us to consider Cognitive Behavioural Therapy (CBT) methods. CBT is based on the concept that while experiencing every situation, one's thoughts, feelings, and behaviours are interacting and influencing each other. A CBT-like method with explicit reflection on TWS that encompasses emotions and possible dissatisfactions or other feelings in addition to behaviours/activities may be the missing link for changing the way people think about how they spend their primary working hours.

Chapter 4

Study 2: Intervening on Time Well Spent

Study 1 showed us that using the concept of TWS allows knowledge workers to foster more holistic thinking of their workday. In Study 2, we explore how reflecting on TWS develops one's personal concept of it and the effect of this reflection on awareness of activities and feelings. We know from Cognitive Behavioral Therapy (CBT), a popular well-validated method for treating a variety of mental-health problems [26], that feelings, thoughts, and actions are strongly intertwined. Thus we sought to leverage part of the CBT method in our work.

In Study 2, we had 11 participants use a CBT-inspired intervention, an ESMbased Android app, for 2 weeks to log their TWS rating, recent activities, and emotions hourly throughout their work day. In contrast to Study 1, participants were obligated to specifically reflect on their emotions instead of providing a general freeform reflection. We investigated the effect of this intervention by conducting surveys before, immediately after, and 2 weeks later asking for personal definitions of TWS and ratings of emotional awareness, activity awareness, and satisfaction. As a control group, we had 11 control participants only fill out these surveys without using the application.

4.1 TWS Intervention

Inspired by Cognitive Behavioural Therapy (CBT) approaches, we developed an ESM-based intervention that served as both a data collection mechanism and a technology probe that allowed us to investigate the impact and utility of reflecting on Time Well Spent. The intervention was conducted with a mobile self-logging tool to manually track activities and feelings and a web app for visualizing and further self-reflection on users' logged data. By conducting surveys before and after the intervention phase, we explore the impact of self-logging and self-reflection on an individual's personal concept of TWS.

4.1.1 A CBT-Inspired Approach

Given the focus on emotion-driven explanations of TWS by some participants in Study 1, we were inspired to leverage the process of CBT for the design of our followup study (see Related Work for an overview of CBT). The basic approach is to have the user self-report and reflect on their feelings, thoughts and behavior through a combination of mobile self-logging (ESM) and a web-based visualization that aggregates the data over longer periods of time. We required users to log and rate how well they spent their time (TWS), what they were currently doing (the behaviour aspect of CBT), and how they felt at the moment (the feeling aspect of CBT). This approach is akin to the diaries or mood logs that CBT clients keep and that help to explore the interactions between feelings, thoughts and behavior. The idea thereby is that if the client is generally dissatisfied with their feelings towards how they spend their time, then they have to change either their thoughts or their behaviors. They can find out which one should change by recording experiences. This is important for recognizing patterns and progress because memory is not trustworthy and can be distorted over time.

In contrast to the free-form reflection we asked for in Study 1, we explicitly ask the participant to reflect on their feelings each hour using a list of emotional and physical states in this study. The context for our study, the primary working hours of the participant, is continuous. For contexts with more 'continuous' activities, like the day-to-day activities while living with depression, low-intensity CBT commonly has clients record their moods at regular intervals throughout the day (rather than just at triggers) to reinforce positive emotions instead of only highlighting negative ones [8, 43]. The context for our study, the primary working hours of the participant, is similarly continuous so we opted to use the ESM style of data collection as an approximation of the CBT method. This is in contrast to using CBT to reflect on triggering events at 'discrete' points throughout the day, which is more commonly used with behaviours such as test-taking anxiety or disordered eating.

4.1.2 Mobile Self-Logging Tool

The mobile self-logging toolkit was built from OmniTrack [30]. OmniTrack enables customized tracking by allowing users to define their own trackers to track and log data relevant to them. We created a custom version of the OmniTrack app with our own Time Well Spent (TWS) tracker (Figure 4.1). OmniTrack can schedule reminders which will prompt users to log an entry in the app through a mobile system notification. An initial list of activities and feelings are populated based on results from Study 1, but users are can customize the list based on their own workday experience.

4.1.3 Visualization

We also created a web-based visualization for participants to review their data. Our visualization was implemented with the MEAN stack [1] and utilized D3 for rendering charts. It consists of both a daily and weekly view (see Figure 4.2). The daily view visualizes logged entry data on a daily level, allowing users to see how their TWS ratings change throughout the day, and what activities and feelings they are experiencing at a particular time. The weekly view aggregates data across a week, allowing users to compare TWS ratings across each day of the week and to see how their ratings are distributed. It also displays a list of the top positive, negative, and fluctuating (varying TWS ratings) activities and feelings.

4.1.4 Apparatus

The OmniTrack platform and our visualization web app was set up on an Ubuntu 18.04.2 virtual machine (20GB disk space, 4GB RAM, 1 CPU). All logged data

10:2	9				▼⊿ 0	10:3	2	0 1	0:3	3 🔷	il 0 -
×	New [Tin	ne We	ell Spent	ltem		×	New [Time Well Spent] Item	:	×	New [Time Well Spent] Item	
•	* Time				Just now	•	* What have you been doing?		•	* What have you been feeling?	
	Sep 4, Wed, 2019						Meeting			Productive	
	^		~		^		Email			Accomplished	
	10	:	29	:	AM		Lunch			Frustrated	
	~		~		~		Coffee			Progressing	
	* How well have you been spending your time?						Reading			Tired	
•							Writing			Energized	
							Client communication			Stressed	
	1 Extremely	2	3 Neutral		4 5 Extremely		Talking on the phone			Excited	
	Unwell				Well		Browsing news online			Optimistic	
	* What hav	e vou l	oeen doinc	1?			🕕 Add New Entry		_		
	SAVE ITEM						SAVE ITEM			SAVE ITEM	
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Figure 4.1: Our TWS tracker on the OmniTrack app. Users inputted the time of entry, rated their TWS, and logged their activities and emotions. Multiple activities and emotions could be selected, and the lists were customizable.

was stored on a MongoDB instance and was only accessed locally on the same virtual machine.

4.2 Method

We conducted an in-situ study over the course of four weeks to investigate the impact of and participants' reaction to our ESM-based intervention. Supporting material for Study 2 can be found in Appendix B.

4.2.1 Participants

Participants were recruited through convenience sampling and UBC's public study recruitment platform. To be eligible for the study, participants needed to (REQ1) be a graduate student enrolled in a research-based program; (REQ2) not take an extended (more than 3 working days) holiday for the next month; (REQ3) have some dissatisfaction with how they currently spend their time at work, and a desire



Figure 4.2: (a) In the daily view: a Gantt-like chart that visualizes activities and feelings. TWS ratings are colour-coded. (b) In the weekly view: the chart allows users to compare TWS ratings across various times and days of the week.

for improvement in that area of their life; (REQ4) not have taken part in Study 1.

We chose to only recruit graduate students (REQ1) because of their often flexible schedules, task autonomy, and frequent interactions with technology, facets that all make up a modern knowledge worker. In addition, graduate students were chosen for their ease of access for our research team. REQ3 was chosen as the self-reflection was found from Study 1 to be more helpful for individuals who are dissatisfied with the way they spend their time. It's also an important part of CBT that the individual is engaged with the self-monitoring, so participants should have an active interest in self-improvement.

Of the 57 people who completed the eligibility survey, we recruited the 22 participants (8 females, 13 males, 1 opted out of reporting gender) who satisfied the eligibility requirements. Their ages ranged from 21 to 35 (M = 27.1, SD = 3.42). Participants were pursuing graduate degrees in various fields (Computer Science, Engineering, Forestry, Linguistics, etc.). We randomly assigned them to one of the conditions, with the exception that if a participant assigned to the intervention did not own an Android phone, they were reassigned to the control group. All
participants were given a \$50 CAD gift card for their involvement in the study.

4.2.2 Procedure



Figure 4.3: A timeline of the procedure of Study 2.

Participants in both the control and intervention conditions completed three surveys (initial, mid, final) as they progressed in the study. In each survey (initial, mid, final), participants first defined their personal concept of 'Time Well Spent'. Then, they rated how well they spent their time at work (TWS), their level of satisfaction with their time at work (satisfaction), their awareness of the activities during their workday (awareness of activities), and their awareness of their feelings during the workday (awareness of emotions) on 5-point Likert scales. They also listed the top 5 Time Well Spent (positive) and Time Not Well Spent (negative) activities.

Participants began the study by signing a consent form and completing the initial survey. After completing the initial survey, participants in the intervention group were given a slideshow with installation and usage instructions for the OmniTrack application and our web-based visualization. In addition, members of the research team were available for technical support. Experience sampling began the day after the intervention was successfully set up, for 2 weeks (14 days). In our intervention, we made use of interval-contingent sampling [25] during participants' primary working hours (default was set to 9:00 AM to 5:00 PM on weekdays, at the start of the hour, for a total of 9 reminders a day). Participants also received an additional email reminder to check and reflect on the visualization at the start of each day (9:00 AM). Although participants received 9 reminders each day, they were allowed to customize the times and number of hourly reminders to fit their

own working schedule. Participants were only required to log a minimum of 4 entries a day for it to be counted as a complete day. In the period of 2 weeks, if participants did not complete 8 days, we extended the period until they did.

After 2 weeks, all participants filled out the mid survey. The mid survey asked intervention group participants to rate the usefulness of the intervention. For the final 2 weeks, intervention group participants were allowed to continue taking part in the intervention, but they were no longer required to. However, since only one participant continued to use the intervention, we treat this time period as one of no intervention. The mid and final surveys also asked participants to compare their responses to the above questions from the previous surveys and elaborate on differences, if any. Upon completion of the final survey (2 weeks after the mid survey), we conducted a 5-10 minute semi-structured interview where we asked participants of both groups to elaborate on their experiences in the study, speaking particularly to their awareness of whether or not their time was well spent. Prior to the post-study interview, we did not mention the term 'productivity'. Whenever the term was mentioned by participants in the survey responses, it came from them without prompting. The interview was audio-recorded and transcribed for further analysis.

4.2.3 Data Analysis

Coding of TWS Definitions

For the TWS definitions, I coded the 66 definitions (22 across 3 surveys) according to our themes and subthemes from Study 1. We then followed the same thematic analysis approach [11] for analyzing both the open-ended survey responses (e.g., explanation of differences across surveys) and the interview transcripts. In terms of analysis for the interviews, another researcher and I independently coded a subset of the entries (6 transcripts; 27%) to identify emerging themes in regards to the impact of the study and awareness changes, often multi-coding definitions as they can include more than one theme. The full set of 22 were coded by myself after an agreement was reached. We used this set of codes to continue coding the self-reported differences in definitions after verifying the coding worked for this similar

type of question.

Within-Subjects Changes in TWS Definitions

After coding all the definitions and in order to take a first step in understanding whether participants were refining their definition of TWS during our study, we (1) analyze whether there was a change in definition themes identified in each survey and (2) assess whether they were aware of this change. We base this assessment on the survey question where we show the current and previous definition and ask if there is a difference and why. This comparison is done twice for each participant: (a) between initial and mid surveys, and (b) between mid and final surveys.

Likert Scale Analysis

In each of the 3 surveys, participants rated how well they spent their time at work (TWS), their level of satisfaction with their time at work (satisfaction), their awareness of the activities during their workday (awareness of activities), and their awareness of their feelings during the workday (awareness of emotions) on 5-point Likert scales. We ran a 2x3 (group: *control, intervention* x survey: *initial, mid, final*) aligned rank transform ANOVA [60] on each of our 4 dependent variables of TWS, satisfaction, awareness of activities, and awareness of emotions ratings.

4.3 Results

We first report a descriptive summary of participants' logged intervention entries, then detail participants' changes in awareness, TWS definition, and satisfaction. From this point on we will refer to specific participants by their participant number (Px for intervention participants and Cx for control participants).

Descriptive Summary of Logged Intervention Entries

Most participants completed within the expected 2 week duration and without technological issues. 6 out of 11 intervention group participants completed the intervention stage within the expected 2-week duration, by completing at least 8 days of the intervention (minimum of 4 entries per day). The other 5 participants went over by an average of 1.4 days (SD = 0.55), due to various reasons such as hav-

	Control (n=11)	Intervention (n=11)
No Change	2 (C5, C11)	0
Minimal	2 (C4, C7)	3 (P3, P9, P10)
Not Lasting	2 (C2, C11)	1 (P7)
Activities	6 (C1, C3, C6, C8, C9, C10)	6 (P4, P5, P6, P7, P8, P11)
Emotional/Physical State	0	8 (P1, P2, P4, P5, P6, P7, P8, P11)

Table 4.1: Participants reported that they experienced no or minimal awareness change, awareness that was not lasting, increased awareness of activities, or increased awareness of their emotional/physical state. Some participants (C11, P7) were classified with more than one label.

ing irregular workdays when tracking wasn't possible and technical issues causing missed notifications. In total, there were 630 entries across all participants. There was high variation (M = 57.3, SD = 16.88) in the number of logged entries per participant. The average number of logged entries per day (on days with at least one logged entry) was 5.57 (SD = 1.8). Most entries occurred during the weekdays (590 out of 630 total entries, 93.7%). Participants did not visit the visualization frequently. Some only visited the visualization after every couple of days, whereas others only visited it once or twice throughout the entire two weeks (M = 2.27 days visited during the two weeks, SD = 2.3 days).

4.3.1 Changes in Awareness

In order to understand the participant's perceived effect of the study on their awareness, they were explicitly asked to comment on their awareness changes during the interview. All participants were categorized based on their responses in the poststudy interview (see Table 4.1).

The Intervention Led to Increased Emotional Awareness

Only those in the intervention group (8 out of 11) experienced increased awareness of their emotional and physical state while working. Quantitative results from our

		F	Df	Df.res	р	
	Group	.0143	1	20	.9061	
Satisfaction	Survey	6.647	2	40	.0032	**
	Group:Survey	1.129	2	40	.3334	
	Group	.5968	1	20	.4488	
Awareness of Emotions	Survey	.2127	2	40	.8093	
	Group:Survey	6.703	2	40	.0031	**

Table 4.2: Summary of test results from aligned rank transformation ANOVA. There were no significant (p < .05) main or interaction effects for TWS and awareness of activities, so we omit these results.

Likert-scale survey questions triangulated these findings. There was an impact of the intervention on mean awareness of emotions ratings across the three surveys (interaction effect: $F_{2,40} = 6.703$, p = .0031, also see Figure 4.4 and Table 4.2). As a post-hoc analysis, we performed an interaction contrasts test, looking at differences of differences, adjusted by the Holm-Bonferroni method. The difference in emotion awareness ratings between the initial to final surveys (p = 0.002) and the initial to mid surveys (p = 0.007) was shown to be greater in the intervention group than the control group. In other words, there was more positive change in emotional awareness ratings as participants completed the surveys for the intervention group than for the control group, indicating that the intervention had more of an impact on emotional awareness. There was no difference from mid to final (p = 0.64). There were no significant main effects for emotion awareness.

The Intervention led to Awareness of Positive Feelings

The intervention led to awareness of positive feelings. 6 participants explicitly noted in the interview that they were aware of positive feelings in addition to negative feelings. This is important because it validates our decision to use continuous tracking instead of only tracking at triggering events (during negative feelings) in order to reinforce positive feelings instead of only highlighting negative ones. This



Figure 4.4: Mean awareness of emotion ratings for both the control and intervention group, as well as initial, mid, and final surveys. There was a significant interaction effect in emotional awareness ratings, where the intervention group had more positive change in ratings compared to the control group across the final-initial and mid-initial surveys.

increase in emotional awareness also led to positive feelings at the end of the day: "I knew at the end of the day how I spent the entire day, I felt if I had spent the day well then I was more confident" (P11).

For P5, emotional awareness helped to bring light to the positive feelings they experienced each day. P5 said that before, they considered their feelings "only when I was stressed, I would think 'that didn't go well'…" They realized that "now, even the good thing[s] or even if things are just going steady, it's important to have that awareness. Things aren't always going to be amazing in a day, but that's okay. If you have certain moments of good happiness or whatever, or just

productivity, that's fine too."

Emotions and Productivity are Linked

Three participants explicitly made a connection between their emotional and physical state and its impact on their productivity. P6 states: "*It can make you more productive if you're aware of what's bringing your mood up or down.*" P4 also felt that awareness of one's emotional state was like a "*sanity check*", and that the intervention was "*just like how therapists get you to record a journal.*" Interestingly, they also became aware of the converse: the impact of their productivity on their mood or feelings. For example, P8 states: "*On days where I got a lot done, it made me happy to put in my entry.*" However, not all participants felt this way – some participants came to the realization that just because they were being productive, it didn't mean that they would feel satisfied about it. P4 illustrates this in the quote below:

"More often than not, since I'm not very happy with the work that I'm doing I would almost always end up feeling miserable even though I was 'being productive'. At least now I realize that what's making me productive is also making me really really sad. So now I'm trying to balance stuff, or at least not judge myself too harshly when I'm not being productive."

The Intervention Led to Understanding of Distractions

Even though participants in both the intervention and control group experienced an increase in their awareness of their workday activities, only the intervention group better understood the amount of time they spent being distracted. Participants mentioned that the change was with respect to an awareness about which activities contributed positively or negatively to their idea of TWS. By reflecting on their activities in the survey, C10 "*realized that [even though] a couple of things are useful, they are not the best way to spend my time.*" However, only participants in the intervention group (P4, P6, P8) mentioned that the intervention helped them get a better understanding of the amount of time that they spent being distracted, in contrast to just the activities that were distracting. P8 elaborates: "I think it helped me more precisely quantify the amount of time I got distracted throughout

the workday."

Participants from both groups that did not experience any or only minimal awareness change felt like they were already aware of their shortcomings in terms of how they spent their time, and that the surveys or intervention only prompted them to think about it slightly more. For example, P9 remarked, "Even before, I was aware that I was not completely using my time in an efficient way so I don't think my awareness has changed that much."

Some participants also commented about the ephemeral nature of their awareness change. C11 and P7 were classified with this label, as well as with the 'No Change' and 'Activities' labels, respectively. This was done only because C11 believed that their awareness did not change in part because there was no lasting impact, whereas P7 explicitly stated that they did become more aware of their time: *"The whole exercise of reflecting on what I do during the day made me more aware of how I spend my time. Especially after the first week of using it, the impact was the greatest [...] but then after the first week I kind of stopped taking it so seriously and I moved back into my old habits."* (P7)

Aligning Perception and Reality in the Workday

Three participants (P1, P6, P8) in the intervention group mentioned on their own that the intervention helped them recognize the difference between their 'perception' and 'reality' of how they spent their time. P6 said that the intervention allowed them to evaluate whether or not an activity (e.g., taking breaks) that they perceived to be important was actually important in reality: *"Before the study I definitely thought taking adequate breaks and caring for myself was important, but I didn't have a framework to evaluate myself in that way. Now I can make sure that my perception matches my reality."*

On another note, P8 realized that they had thought that the day was shorter than it actually was, and that the intervention helped to identify that belief: "I think it helped me realize how much [time] I have in the day and how much I don't utilize my time properly. I think in a good way and a bad way. In a bad way because I kind of felt ashamed that I wasted so much of my time rather than doing something good with it. And in a good way because I felt that there was so much time in the way and I could get so much done, rather than always feeling like I always have a lot to do." What's common to both these experiences is the underlying theme that our perceptions and beliefs about time can play a large role in how we feel about our workday; and that our ESM-based intervention has potential in helping to uncover or evaluate beliefs.

4.3.2 Broadening Personal TWS Definition

As described in section 4.2.3, we compared themes of definitions between surveys for each participant and assessed whether they identified these changes in the surveys.

Initial to mid surveys: 7 intervention group participants and 6 control group participants changed TWS themes between their definitions. When shown the two definitions in the mid survey and asked to compare them, 7/7 intervention group participants and only 2/6 control group participants saw a difference in the definitions and gave a reason for the change.

For the intervention group, the coded changes in definition match up with the self-reported changes in definition. For example, P5's initial definition of TWS was focused only on making progress in their work, but their mid-survey definition involved satisfaction, meaning, and physical health instead. When asked about the differences, they noted that paying attention to spontaneous moments while using the intervention led them to change their concept of TWS. For the control group, the coded changes were subtle and the differences were often not notable to the participants. For example, the initial definition for C6 included 4 subthemes (Progress, High Quality of Work, Efficiency, Satisfaction or Achievement) while their mid-survey definition continued to contain Progress, it also included 3 different subthemes (Long-Term Plan, Mental Focus, Meaningful and Fun). When asked about the differences, they said nothing has changed about their personal definition.

Participants in the intervention group were more likely to shift to being more emotionally aware. According to the coding of their definitions, 3 participants started listing satisfaction with their work as part of their definition and holistically broadening their definition to fall under the 'how I feel' theme. The same 3 participants noticed their change in definition in the survey and explained how the tracking had helped make this change. For example, P4 noted "*I think all the tracking is making me more conscious of the actions that lead to a satisfactory outcome and made me realize that productivity is not necessarily the same as happiness.*" This evidence for reflecting feeling in TWS definition is a first check on increasing awareness for the intervention group.

Mid to final surveys: 2 intervention group participants and 4 control group participants added or removed a TWS theme to their definition. When shown the two definitions in the final survey and asked to compare them, the same 2 intervention group participants and 2 control group participants saw a difference in the definitions and gave a reason for the change.

Overall, we found that intervention participants were more likely to recognize a change in their definition and could articulate that change and give an explanation for the change. Those in the control group were more likely to say there was no change in definition even if there were explicit changes in TWS themes.

4.3.3 Satisfaction

From our Likert-scale data, we found that there was a mean difference in satisfaction ratings across the surveys (main effect: $F_{2,40} = 6.647$, p = .0032, also see Table 4.2), averaged across both the control and intervention groups. We performed a post-hoc Tukey test on satisfaction, showing that satisfaction increased overall (p = 0.0027) from initial (M = 2.682, SD = 0.780) to final (M = 3.318, SD = 0.894). A trend suggests that satisfaction also increased (p = 0.0502) from mid (M = 2.864, SD = 0.889) to final. Surprisingly, there was no significant increase (p = 0.4977) in satisfaction from initial to mid, which, for the intervention group, would have consisted of the intervention stage. There were no significant main effect for group and no interaction effects.

From the initial to final survey in the control group, 4 participants had an increase in satisfaction, 5 showed no change, and 2 had a decrease. On the other hand, in the intervention group, 7 participants had an increase, 4 showed no change, and 0 decreased. Interestingly, the intermediate steps of initial to mid and mid to final were either not significant or only showed a trend, respectively, potentially hinting



Figure 4.5: Mean satisfaction ratings for each survey level, averaged across both the control and intervention groups. There was a significant main effect for satisfaction ratings across the surveys, where there was an increase in satisfaction from the initial to final survey as well as from the mid to final surveys.

at longer-term implications for satisfaction. In each survey, participants were asked for an explanation for their rating of their satisfaction, so some participants gave a reason for their change in satisfaction.

In the control group, 2 participants commented directly on their change of satisfaction. One began recognizing personal work goals and was satisfied they were being met consistently. Another participant noted they had been thinking about what TWS means to them, but between the mid and final survey they finished writing their thesis and it was satisfying seeing a concrete milestone reached.

The intervention group had 2 participants who commented directly on their

change of satisfaction. One noted that tracking made them more aware of distractions and they have changed their actions to eliminate distractions. Another intervention participant felt more satisfied because using the app to track time gave them the feeling of having things to do everyday and they chose to continue using the app until the end of the study.

Only one participant in the intervention group had decreased satisfaction at the midpoint of the study after the intervention. P6 had holistic definitions of TWS and productivity before the study and said that tracking with the app caused him to become aware of exactly how much time he spends unproductively. After two weeks of tracking, he stated "*I realize that I spend a lot of unfocused time reading news online and this often has a negative effect on my mood.*" Despite reporting a dip in their level of satisfaction at the mid survey, P6 still felt like it was useful to know what was affecting his mood, especially for productivity.

4.3.4 Opinions of the Intervention

Participants felt that the intervention was moderately useful (M = 3.55, SD = 0.934) when rating on a 5-point Likert scale (5 = extremely useful). The intervention was akin to an external check-in that, for some participants, was like a "*coach*" (P9), "*therapist*" (P4) or "*someone to give answers to about how you spent the last hour*" (P11). For P9, the intervention "gave an extra push to finish things today so I could record it and say I was productive."

However, some participants experienced a sense of stress from the intervention's hourly sampling. P10 states: "It was pretty stressful actually because I need to check the tool almost every single hour." P8 also felt pressure to ensure they had a 'good' hour: "It made me very conscious of when the next hour was approaching and if I hadn't had a good hour, then it made me very sad [...] I should have done more."

4.4 Discussion

We have made progress at capturing a more holistic concept of work. In Study 1 we found that capturing holistic thinking was possible using the term TWS, and our data hinted that emotion could play a part in determining whether time was spent

well or not. In Study 2, our results show that using our CBT-inspired experience sampling method, which required users to capture their emotions (more explicitly than in Study 1), as well as activities, shapes users' personal concept of TWS and gives them the self-awareness to articulate these changes. These users also showed significant improvements in emotional awareness compared to the control group.

Consistent with CBT, we found that perceptions and beliefs about time impact feelings about work. What was promising about our intervention was that it had the potential to give participants a 'framework' for evaluating their own perceptions, and to see to what extent they line up with reality. This process has some similarities with that provided by a CBT therapist, who aims to help patients identify and eliminate irrational or disruptive thoughts and beliefs.

Our work on TWS is a first step towards a more holistic performance *measure* for knowledge workers. The method that we used in Study 2 is clearly not one that could be used, in its current form, by company management, for example, to assess their workforce. It is too heavyweight. With considerable more work, the goal will be to refine the method so that it can be lightweight for workers to complete and yet still provide output "data" that allows both workers and management to measure and track over time, in a standardized way, holistically how time is being spent.

In terms of tracking tools, in current tools like RescueTime [53], productivity is quantified through a combination of labeling activities as productive or not and measuring the amount of time spent on each activity. Tools like this are exceptional at this basic level of tracking, easily providing the user with visualizations, text analysis, and trends. We can and should rely on these tools to do the laborious parts of tracking, but for these tools to work more holistically, humans will need to contribute and reflect on their feelings, thoughts, and personal beliefs. A possibility for extending current productivity-based time tracking tools is to introduce lightweight self-monitoring and simulate a CBT-like method. Every once in a while a reflection could be triggered asking the user to reflect more holistically on whether the time was well spent and their feelings with respect to the tracked activities.

Another design implication is the effect of emotional awareness. There is space to explore whether this awareness can lead to manipulation of emotions in order to improve productivity. For example, a tool could have the goal of maintaining a positive affect balance (a ratio of higher positive affect compared to negative affect), as this has been correlated with higher productivity and has the added benefit that maintaining a positive affect balance is inherently holistic. In the near future user-logged self-reflections of affect would have to suffice, but in the longer term it's possible that affect could be detected automatically and actions such as whether to continue working or take a break could be suggested.

Chapter 5

Threats to Validity

5.1 Construct Validity

For both studies, our focus was on characterizing TWS as a holistic concept, therefore we deliberately omitted any mention of 'productivity' in our study method. This decision may have influenced participants to think holistically because of the study design, rather than because of their reflections on TWS. However, we do not believe this was the case, as some participants did not reflect emotionally, and still had a TWS definition that mirrored more traditional productivity definitions.

Asking participants to compare between TWS and productivity may enable us to more directly tease apart the differences, but there could be challenges when comparing between two abstract terms, especially when 'productivity' has been shown to be a complex concept. Extending the scope of the study to the entire day (beyond primary working hours) and involving more types of workers is worth exploring.

5.2 Internal Validity

Objective logging would be more accurate than self-reporting, but objective logging on a computer does not capture activities away from the computer. Since we were most interested in capturing holistic recollection of the day's activities, we felt self-reporting was appropriate and necessary. The experience sampling methodology we use has the standard design limitations. The constant surveying is annoying and may lead to non-compliance from participants. Through piloting the first study, we found that 4 hourly samples were sufficient for reflecting on the workday and participants were not obligated to complete all the surveys on time. We had full compliance with all participants in Study 1. Study 2 was double the length of Study 1 and the hourly sampling over this 2 week period was found to be annoying and tiresome, thus exploring alternate data collection methods or time windows would be valuable. Despite the fatigue, all participants in our study were engaged and completed the required samples.

Our second study was also limited by potentially confounding factors. Based on our current method, it is difficult to say whether the change in awareness of emotions was because of the CBT-inspired questions or because of the frequent sampling. If the control group had also received ESMs, but of a neutral nature, we could better refine the contribution of having participants reflect on their emotions. This will be important future work. Instead our contribution lies in the combination of sampling that includes emotion reflection and the fact that we saw the impact of this combination.

5.3 External Validity

Our research only captures 40 definitions from across 13 different occupations of knowledge workers, thus the themes are not likely exhaustive. However, our results are sufficiently promising to see if using the concept of TWS in conjunction with an intervention, might influence workers' awareness of how they are spending their time. Furthermore, in Study 2 we only used graduate students as participants. While graduate students have a flexible schedule, they may be more biased towards focusing on their own work than working in teams to accomplish organizational goals. For this reason, the results may not be generalizable to all knowledge workers. Another limitation we faced in designing this study is biasing individuals towards thinking more about TWS or productivity. All participants were asked priming questions about the concept of TWS, so we did not have a true control group.

Chapter 6

Conclusion

In this thesis, we report on an experience sampling study (n=40) that provides a preliminary characterization of Time Well Spent, and shows empirical evidence that the term TWS captures a more holistic notion of work. We further report on a study (n=22) that provides an empirical understanding of the impact of reflecting on TWS, especially in terms of workers gaining emotional awareness and seeing change in their personal concept of TWS. As we think about the holistic re-design of current productivity and time tracking tools to support the modern knowledge worker's needs, we envision highlighting the integration of emotion tracking and the need for human self-reflection in addition to automatic tracking. This thesis brings us one step closer to not only a more holistic, realistic, and standardized measure of work performance for knowledge workers, but also a healthier and more emotionally-aware workforce. Today's information age provides us with a multitude of personal and professional technologies that greatly assist us in our work, but often at the cost of increased stress. A holistic way of thinking about time at work moves us to having our technology working for us instead of against us.

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Appendix A

Study 1 Supporting Materials

A.1 Consent Form



The University of British Columbia 201-2366 Main Mall Vancouver BC Canada V6T 1Z4

Department of Computer Science

Time Well Spent Study

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Study Purpose

The overall objective of this research is to better understand and improve wellbeing at work. To accomplish this objective, we are investigating how people feel about and self-evaluate the way they spend their time during their primary working hours of the day. By understanding how professionals define and approach wellbeing at work, we will be able to identify design recommendations and develop better tool support for improving overall wellbeing at work.

Study Procedure

This study is a diary study that will take no longer than a total of 2 hours over the course of 5 days. The study is composed of three parts: (a) a short introduction session to explain the study and ask for consent, (b) a five-day diary study, and (c) a final survey. If you agree to participate, we will ask you to complete a short survey (approx. 1 minute) every work hour over the course of five work days in which we ask you about how you spent your time and how you felt about it. In addition, we will ask you to reflect about your workday at the end of each of the five work days (max. 8 minutes per day). In the final survey, we will ask you questions about your own characterization of time well spent, your workplace environment, some demographics and also have you complete a standardized personality type test (max. 30 minutes).

Known Risks

We do not anticipate any significant risks for taking part in this study. Also, you can terminate the study at any point in time without providing any reason.

Reimbursement

Participants who complete the study will receive compensation of \$40 CAD in their choice of gift card (Amazon, Starbucks, iTunes). Participants can withdraw from the study at any time without a reason and will receive a prorated reimbursement.

Benefits of Participation

Participants will get a chance to reflect on how well they spend their time and their time management patterns and strategies. The final survey includes questions for standardized personality-type inventories; we will send personal results after the full study is completed.

Data, Storage & Confidentiality

Your identity will be kept confidential. We will only record your identifying information if you want to participate in the draw for a prize. Your identifying information will not be stored with this data nor will it be associated with the data after it has been analyzed.

Use of the Data

The results of this study will potentially appear in both internal and external academic research presentations, theses and publications, such as academic journals and conference proceedings. No identifying information will be included in any of these.

Contact for information about the study

If you have any questions about or desire further information with respect to the study, you may contact Hayley Guillou (<u>guillouh@cs.ubc.ca</u>), Dr. Joanna McGrenere (<u>joanna@cs.ubc.ca</u>), or Dr. Thomas Fritz (<u>fritz@cs.ubc.ca</u>).

Who to contact if you have complaints or concerns about the study

If you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics at 604-822-8598 or if long distance e-mail RSIL@ors.ubc.ca or call toll free 1-877-822-8598.

Consent

We intend for your participation in this project to be pleasant and stress-free. Your participation in this study is entirely voluntary. You have the right to refuse to participate in this study and you are free to withdraw your participation at any point during the study, without giving a reason and without any negative consequence. Any information you contribute up to your withdrawal will be retained and used in this study, unless you request otherwise.

By answering yes, you confirm that

- You agree to participate in the study and had enough time to make this decision, and that
- you are at least 18 years old.

A.2 Hourly Survey

Time Well Spent

Please reflect on the time since your last survey, or since the beginning of your workday.

What did you spend this time doing?

- What personal tasks did you do?
- Did you take any breaks? What did you do and for how long?
- Did you talk to anyone?
- What did you work on?

How did you spend your time?

How do you feel about how you spent your time? (move the gauge to adjust the level of frown or smile on the face)



Why do you feel this way?

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A.3 End of Day Survey

Time Well Spent

Please reflect on the time since your last survey, or since the beginning of your workday.

What did you spend this time doing?

- What personal tasks did you do?
- Did you take any breaks? What did you do and for how long?
- Did you talk to anyone?
- What did you work on?

How did you spend your time?

How do you feel about how you spent your time? (move the gauge to adjust the level of frown or smile on the face)



Why do you feel this way?

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A.4 TWS Survey

What is your name?

What is your occupation and/or field of study?

What is your gender?

O Male

O Female

Ο	Other	

What is your age?

Time Well Spent

Over the past workweek, you have been reflecting on how you have been spending your time. How would you define "time well spent"?

Workplace

What industry do you work in?

What is the total number of employees in your company?

- **O** 1-19
- O 20-49
- O 50-99
- **O** 100-249
- O 250+

Where do you work?

	In	(one	of)	my	company's	main	office(s
--	----	------	-----	----	-----------	------	----------

- In a smaller office
- □ In the office of another company
- In a co-working space
- Remotely at home
- Remotely (other)
- In a home office (not remotely)
- Other

What is the total number of employees at your location?

- O 1-19
- **O** 20-49
- **O** 50-99
- **O** 100-249
- O 250+

Generally on a typical work day which of the following do you have the freedom to choose?



- Time to start work
- Time to end work
- Number of breaks in a day
- Time to take breaks
- Length of breaks
- Time to take lunch

Please mark the extent to which you agree with the following statements:

	Neit Strongly Somewhat agree				Veither gree nor Somewhat		
	uisagree	Disagree	uisagiee	uisagree	agree	Agree	agree
I create my own tasks.	0	0	0	0	0	0	0
l am given tasks to complete.	0	0	0	0	0	0	0
I am expected to complete tasks in a certain order.	0	0	0	0	Ο	0	0
l am free to work on any task throughout the work day.	0	0	0	0	0	0	0
l use my work computer for personal tasks.	0	Ο	0	0	0	0	0
I am allowed to use my personal cell phone at my desk.	0	0	0	0	Ο	0	0
l use my personal cell phone at my desk.	0	0	0	Ο	0	0	0

--

	Strongly Disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
My activity on my computer is logged or monitored.	0	0	0	0	0	0	0
My employer uses a website blocker to block certain sites.	0	0	0	0	Ο	0	0
My employer can see my online activity.	Ο	0	0	Ο	0	0	0
My superior can physically view my computer monitor during the workday.	Ο	Ο	0	Ο	0	0	0
My colleagues can physically view my computer monitor from their desks.	Ο	0	0	Ο	0	0	0
Anyone who enters my workspace can physically view my computer monitor.	0	Ο	0	0	0	0	Ο
	Strongly Disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
---	----------------------	----------	----------------------	----------------------------------	-------------------	-------	-------------------
l often think about how my activity is monitored at work.	0	0	0	0	Ο	0	0
I change what I'm doing on my computer depending on who can see my screen.	0	0	0	0	0	0	0

Susceptibility to Distractions

In general, in a typical day how distracted do you feel by:

	not at all	low	slightly	neutral	moderately	very	extremely
social media	0	0	0	0	0	Ο	0
email	0	0	0	0	0	0	0
face-to-face informal workplace interactions	0	0	0	0	Ο	0	0
notifications	0	0	0	Ο	0	0	0
text messaging	0	0	0	0	0	Ο	0
phone calls	0	0	0	0	Ο	Ο	0

Impulsivity Survey

Below are a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statement.

	Agree Strongly	Agree Some	Disagree Some	Disagree Strongly
I generally like to see things through to the end.	Ο	Ο	0	Ο
My thinking is usually careful and purposeful.	Ο	Ο	0	Ο
When I am in great mood, I tend to get into situations that could cause me problems.	Ο	Ο	Ο	Ο
Unfinished tasks really bother me.	0	Ο	0	Ο
I like to stop and think things over before I do them.	Ο	Ο	0	Ο

	Agree Strongly	Agree Some	Disagree Some	Disagree Strongly
When I feel bad, I will often do things I later regret in order to make myself feel better now.	Ο	0	Ο	0
	Agree Strongly	Agree Some	Disagree Some	Disagree Strongly
Once I get going on something I hate to stop.	0	0	0	0
I quite enjoy taking risks.	0	0	0	0
I tend to lose control when I am in a great mood.	Ο	0	0	0
l finish what l start.	0	0	0	0
I tend to value and follow a rational, "sensible" approach to things.	Ο	0	0	0
I welcome new and exciting experiences and sensations, even if they are a little frightening and	0	0	0	Ο
unconventional.				
unconventional.	Agree Strongly	Agree Some	Disagree Some	Disagree Strongly
unconventional. When I feel rejected, I will often say things that I later regret.	Agree Strongly	Agree Some O	Disagree Some O	Disagree Strongly
unconventional. When I feel rejected, I will often say things that I later regret. I would like to learn to fly an airplane.	Agree Strongly O O	Agree Some O O	Disagree Some O O	Disagree Strongly O O
unconventional. When I feel rejected, I will often say things that I later regret. I would like to learn to fly an airplane. Others are shocked or worried about the things I do when I am feeling very excited.	Agree Strongly O O	Agree Some O O	Disagree Some O O O	Disagree Strongly O O O
unconventional. When I feel rejected, I will often say things that I later regret. I would like to learn to fly an airplane. Others are shocked or worried about the things I do when I am feeling very excited. I would enjoy the sensation of skiing very fast down a high mountain slope.	Agree Strongly O O O O O O O O O O O O O O O O O O O	Agree Some O O O	Disagree Some O O O	Disagree Strongly O O O O O O
unconventional. When I feel rejected, I will often say things that I later regret. I would like to learn to fly an airplane. Others are shocked or worried about the things I do when I am feeling very excited. I would enjoy the sensation of skiing very fast down a high mountain slope. I usually think carefully before doing anything.	Agree Strongly O O O O O O O O O O O O O O O O O O O	Agree Some O O O O	Disagree Some O O O O O O	Disagree Strongly O O O O O O O O O O O O O O O O O O O
 unconventional. When I feel rejected, I will often say things that I later regret. I would like to learn to fly an airplane. Others are shocked or worried about the things I do when I am feeling very excited. I would enjoy the sensation of skiing very fast down a high mountain slope. I usually think carefully before doing anything. I tend to act without thinking when I am really excited. 	Agree Strongly O O O O O O O O O O O O O O O O O O O	Agree Some O O O O O	Disagree Some O O O O O O O O	Disagree Strongly O O O O O O O O O O O O O O O O O O O

Big 5 Inventory

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others?

	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
1. Is talkative	0	0	0	0	0

	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
2. Tends to find fault with others	0	0	0	0	Ο
3. Does a thorough job	0	Ο	Ο	0	0
4. Is depressed, blue	0	0	0	0	0
5. Is original, comes up with new ideas	Ο	Ο	Ο	0	Ο
	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
6. Is reserved	0	0	0	0	0
7. Is helpful and unselfish with others	0	0	Ο	Ο	0
8. Can be somewhat careless	Ο	0	0	Ο	0
9. Is relaxed, handles stress well	Ο	0	0	Ο	Ο
10. Is curious about many different things	0	Ο	Ο	0	Ο
	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
11. Is full of energy	0	0	0	0	0
12. Starts quarrels with others	0	0	0	0	Ο
13. Is a reliable worker	0	0	0	0	0
14. Can be tense	0	0	0	0	0
15. Is ingenious, a deep thinker	0	Ο	0	0	0

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others?

	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
16. Generates a lot of enthusiasm	0	0	0	0	0
17. Has a forgiving nature	0	0	Ο	0	0
18. Tends to be disorganized	0	0	0	0	0
19. Worries a lot	0	0	0	0	0
20. Has an active imagination	0	0	0	0	Ο
	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
21. Tends to be quiet	0	0	Ο	Ο	0

	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
22. Is generally trusting	0	Ο	0	0	0
23. Tends to be lazy	0	0	0	0	0
24. Is emotionally stable, not easily upset	0	0	Ο	0	Ο
25. Is inventive	0	0	0	0	0
	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
26. Has an assertive personality	0	0	0	0	Ο
27. Can be cold and aloof	0	0	0	0	0
28. Perseveres until the task is finished	0	Ο	0	0	0
29. Can be moody	0	0	0	0	0
30. Values artistic, aesthetic experiences	Ο	0	0	0	Ο

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others?

	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
31. Is sometimes shy, inhibited	0	Ο	Ο	0	Ο
32. Is considerate and kind to almost everyone	0	0	0	0	Ο
33. Does things efficiently	0	0	Ο	0	0
34. Remains calm in tense situations	Ο	Ο	Ο	Ο	Ο
35. Prefers work that is routine	0	0	Ο	0	0
	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
36. Is outgoing, sociable	0	0	0	0	0
37. Is sometimes rude to others	0	0	0	0	0
38. Makes plans and follows through with them	0	0	0	0	Ο
39. Gets nervous easily	0	0	Ο	0	0
40. Likes to reflect, play with ideas	0	Ο	0	0	Ο
	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
41. Has few artistic interests	0	0	0	0	0

	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly	
42. Likes to cooperate with others	0	0	0	0	Ο	
43. Is easily distracted	0	0	0	0	0	
44. Is sophisticated in art, music, or literature	0	Ο	0	Ο	0	

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Theme	
Subtheme	Example Quotes
What I work on	
Progress	"making tangible progress towards ob- jectives"
Completion	"time during which (all or the majority of) what I intended to reasonably finish was finished"
Long-term goal	"I consider time to be managed well when I have finished all the tasks I had on my to-do list by the end of the day. I create my to-do list based on larger projects, so that means I'm closer to completing my long-term goals every- day."
Short-term goal	"I spend well my time if I accomplish whatever goals I've set for the day"
Quality of work	"providing quality customer service"; "praise from coworkers or managers about quality or quantity of work ac- complished"
How I work	
Punctuality	"Meeting my deadlines and staying on top of my paperwork."; "Getting tasks done in a timely manner"
Efficiency	"I work as efficiently as planned"; "plan to do things efficiently"; "taking regular breaks to avoid burn-out which overall makes my time spent more effi- cient"

A.5 TWS Definition Codebook

MartalEans	"time spent focused and attentive to my
Mental Focus	work"
How I feel	
Setisfaction on achievenent	"when I felt satisfied that I used my
Satisfaction of achievement	abilities adequately"
	"having fun"; "I would define it as
Meaningful and fun	time spent on things/tasks that I feel are
	worth my attention."
Avaidance of quilt	"Spending my time in a way that I
Avoidance of guint	don't feel guilty at the end of the day"
How I take care of myself	
	"Accomplishing many tasks, bonding
Physical health	with co-workers, or getting mid-day
	breaks to move and walk"
	"helps me refresh/refocus to work
Mental and emotional health	more efficiently or improve my mental
	health"
	'time spent socializing is also enrich-
Social bonds	ing, as long as it doesn't take up too
	large a portion of a workday."
	"taking regular breaks"; "getting mid-
Breaks from work	day breaks to move and walk"; "taking
	well-placed breaks"

Appendix B

Study 2 Supporting Materials

B.1 Consent Form



UBC Department of Computer Science ICICS/CS Building 201-2366 Main Mall Vancouver, B.C., V6T 1Z4

Time Well Spent Study - Consent Form

Principal Investigator

Joanna McGrenere, Professor, Department of Computer Science, UBC (joanna@cs.ubc.ca, 604-827-5201)

Co-Investigator

Hayley Guillou, MSc student, Department of Computer Science, UBC

Kevin Chow, Student, Department of Computer Science, UBC

Thomas Fritz, Professor, Department of Informatics, University of Zurich, Affiliate Professor, Department of Computer Science, UBC

Study Purpose and Procedure

The overall objective of this research is to better understand how people define Time Well Spent during their primary working hours. This study will take up to a total of approximately 4 hours over the course of 4 weeks. There will be three surveys (at the beginning, 2 weeks later, and 4 weeks later) asking about satisfaction with the way your time is spent at work. Some participants will be asked to download and use an Android app which will provide hourly notifications during primary working hours for experience sampling and allow the user to see a visualization of their responses. After 4 weeks, participants will be asked to participate in a 5-15 minute interview over Skype.

Known Risks

We do not anticipate any significant risks for taking part in this study. Also, you can terminate the study at any point in time without providing any reason.

Reimbursement

Participants who complete the study will receive compensation of a \$50 gift card. Participants can withdraw from the study at any time without a reason and will receive a prorated reimbursement.

Benefits of Participation

Participants will get a chance to reflect on how well they spend their time and their time management patterns and strategies.

Data, Storage & Confidentiality

Your identity will be kept confidential. Your identifying information will not be stored with this data nor will it be associated with the data after it has been analyzed. The results

will be made public through scholarly publications, presentations, and academic theses; however, no identifying information will be included in any of these.

Contact for information about the study

If you have any questions about or desire further information with respect to the study, you may contact Hayley Guillou (guillouh@cs.ubc.ca), Dr. Joanna McGrenere (joanna@cs.ubc.ca), or Dr. Thomas Fritz (<u>fritz@cs.ubc.ca</u>).

Who to contact if you have complaints or concerns about the study

If you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics at 604-822-8598 or if long distance e-mail RSIL@ors.ubc.ca or call toll free 1-877-822-8598.

Consent

We intend for your participation in this project to be pleasant and stress-free. Your participation in this study is entirely voluntary. You have the right to refuse to participate in this study and you are free to withdraw your participation at any point during the study, without giving a reason and without any negative consequence. Any information you contribute up to your withdrawal will be retained and used in this study, unless you request otherwise.

By answering yes, you confirm that

- You agree to participate in the study and had enough time to make this decision, and that

- you are at least 18 years old.

B.2 Initial Survey for Intervention Group



Default Question Block

When taking a moment to reflect on a period of time that you were working (whether it's the past hour or the whole day), you likely have a personal sense of how well you spent that time.

What are your personal criteria for defining whether or not your time is well spent during the work day? In other words, **how would you define the concept of "Time Well Spent"**?

How well do you generally spend your time at work?

- Extremely well
- Very well
- Moderately well
- Slightly well
- Not well at all

What is your level of satisfaction with how your time is spent during your primary working hours?

- Extremely satisfied
- Somewhat satisfied
- Neither satisfied nor dissatisfied

Somewhat dissatisfied

Extremely dissatisfied

Why?

What is your level of awareness of how **you spend** your workday? I.e. do you feel aware of what **activities** you are doing hour-by-hour?

- Extremely Aware
- 🔵 Very Aware
- Moderately Aware
- Slightly Aware
- Not Aware At All

What is your level of awareness of how **you feel** during your workday? I.e. do you feel aware of what **emotions** you are feeling hour-by-hour?

- Extremely Aware
- 🔵 Very Aware
- Moderately Aware
- 🔵 Slightly Aware
- Not Aware At All

Off the top of you head, list at least 5 activities that you feel to be spending your time well during the workday?

Off the top of your head, list at least 5 activities that you feel to be **NOT** spending your time well during the workday?

What tools or techniques have you tried to improve how well you spend time at work?

What tools or techniques do you currently use to improve how well you spend time at work?

What Google account email address will you be using for logging into the app and visualization tool? (*this doesn't need to be your personal account, see the instructions*

document from the email for details)

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B.3 Initial Survey for Control Group



Default Question Block

When taking a moment to reflect on a period of time that you were working (whether it's the past hour or the whole day), you likely have a personal sense of how well you spent that time.

What are your personal criteria for defining whether or not your time is well spent during the work day? In other words, **how would you define the concept of "Time Well Spent"**?

How well do you generally spend your time at work?

- Extremely well
- Very well
- Moderately well
- Slightly well
- Not well at all

What is your level of satisfaction with how your time is spent during your primary working hours?

- Extremely satisfied
- Somewhat satisfied
- Neither satisfied nor dissatisfied

Somewhat dissatisfied

Extremely dissatisfied

Why?

What is your level of awareness of how **you spend** your workday? I.e. do you feel aware of what **activities** you are doing hour-by-hour?

- Extremely Aware
- 🔵 Very Aware
- Moderately Aware
- Slightly Aware
- Not Aware At All

What is your level of awareness of how **you feel** during your workday? I.e. do you feel aware of what **emotions** you are feeling hour-by-hour?

- Extremely Aware
- 🔵 Very Aware
- Moderately Aware
- 🔵 Slightly Aware
- Not Aware At All

Off the top of you head, list at least 5 activities that you feel to be spending your time well during the workday?

Off the top of your head, list at least 5 activities that you feel to be **NOT** spending your time well during the workday?

What tools or techniques have you tried to improve how well you spend time at work?

What tools or techniques do you currently use to improve how well you spend time at work?

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B.4 Mid Survey for Intervention Group

Default Question Block

When taking a moment to reflect on a period of time that you were working (whether it's the past hour or the whole day), you likely have a personal sense of how well you spent that time.

What are your personal criteria for defining whether or not your time is well spent during the work day? In other words, **how** would you define the concept of "Time Well Spent"?

How well do you generally spend your time at work?

- O Extremely well
- O Very well
- O Moderately well
- O Slightly well
- O Not well at all

What is your level of satisfaction with how your time is spent during your primary working hours?

- O Extremely satisfied
- O Somewhat satisfied
- O Neither satisfied nor dissatisfied
- O Somewhat dissatisfied
- O Extremely dissatisfied

Why?

What is your level of awareness of how **you spend** your workday? I.e. do you feel aware of what **activities** you are doing hour-by-hour?

- O Extremely Aware
- O Very Aware
- O Moderately Aware
- O Slightly Aware
- O Not Aware At All

What is your level of awareness of how **you feel** during your workday? I.e. do you feel aware of what **emotions** you are feeling hour-by-hour?

- O Extremely Aware
- O Very Aware
- O Moderately Aware
- O Slightly Aware
- \bigcirc Not Aware At All

Off the top of your head, list at least 5 activities that you feel to be spending your time well during the workday?

Off the top of your head, list at least 5 activities that you feel to be **NOT** spending your time well during the workday?

Block 1

Take a moment to look at the differences between these two response sets.

```
Initial Survey:
$ {e://Field/init_tws}
```

Today: \${q://QID2/ChoiceTextEntryValue}

How has your definition of **Time Well Spent** changed in the past 2 weeks, if at all? If there has been a change, what has

Take a moment to look at the differences between these **two lists of activities** that you consider to be **spending your time well**.

Initial Survey:
\$ {e://Field/init_pos}

Today: \${q://QID7/ChoiceTextEntryValue}

How has your list of activities changed in the past 2 weeks, if at all? If there has been a change, what has prompted this change?

Take a moment to look at the differences between these **two lists of activities** that you consider to be **NOT** spending your time well.

Initial Survey:

\${e://Field/init_neg}

Today: \${q://QID8/ChoiceTextEntryValue}

How has your list of activities changed in the past 2 weeks, if at all? If there has been a change, what has prompted this change?

Block 2

In this study, we are *most interested* in learning about how the **process** of reflecting and seeing an overview of the way your time is spent helps you. *Secondarily*, we are interested in getting feedback on the **tool** we provide (the combination of the **tracking app** and **visualization website**).

By using this **process**, what did you learn about the way you spend your time, if anything?

Was this **process** of self-reflection on your time at work helpful? What insights did you gain from it? How has the **process** of using the self-reflection tool made a difference in the way *you feel* your time is spent, if at all?

How useful was the **tool**?

- O Extremely useful
- O Very useful
- O Moderately useful
- O Slightly useful
- O Not at all useful

Would you continue to use the **tool**? Why or why not?

How often or how many times did you look at the visualization website over the 2 week tracking period?

What would you like to have seen on the **visualization website** that is not currently possible to see?

What improvements would you like to see made to the **app** and **visualizations**?

Please feel free to leave any comments about your experience with the **app** and **visualizations** below.

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B.5 Mid Survey for Control Group

Default Question Block

When taking a moment to reflect on a period of time that you were working (whether it's the past hour or the whole day), you likely have a personal sense of how well you spent that time.

What are your personal criteria for defining whether or not your time is well spent during the work day? In other words, **how** would you define the concept of "Time Well Spent"?

How well do you generally spend your time at work?

- O Extremely well
- O Very well
- O Moderately well
- O Slightly well
- O Not well at all

What is your level of satisfaction with how your time is spent during your primary working hours?

- O Extremely satisfied
- O Somewhat satisfied
- O Neither satisfied nor dissatisfied
- O Somewhat dissatisfied
- O Extremely dissatisfied

Why?

What is your level of awareness of how **you spend** your workday? I.e. do you feel aware of what **activities** you are doing hour-by-hour?

- O Extremely Aware
- O Very Aware
- O Moderately Aware
- O Slightly Aware
- O Not Aware At All

What is your level of awareness of how **you feel** during your workday? I.e. do you feel aware of what **emotions** you are feeling hour-by-hour?

- O Extremely Aware
- O Very Aware
- O Moderately Aware
- O Slightly Aware
- \bigcirc Not Aware At All

Off the top of your head, list at least 5 activities that you feel to be spending your time well during the workday?

Off the top of your head, list at least 5 activities that you feel to be **NOT** spending your time well during the workday?

Block 1

Take a moment to look at the differences between these two response sets.

```
Initial Survey:
$ {e://Field/init_tws}
```

Today: \${q://QID2/ChoiceTextEntryValue}

How has your definition of **Time Well Spent** changed in the past 2 weeks, if at all? If there has been a change, what has
Take a moment to look at the differences between these **two lists of activities** that you consider to be **spending your time well**.

Initial Survey:
\$ {e://Field/init_pos}

Today: \${q://QID7/ChoiceTextEntryValue}

How has your list of activities changed in the past 2 weeks, if at all? If there has been a change, what has prompted this change?

Take a moment to look at the differences between these **two lists of activities** that you consider to be **NOT** spending your time well.

Initial Survey:

\${e://Field/init_neg}

Today: \${q://QID8/ChoiceTextEntryValue}

How has your list of activities changed in the past 2 weeks, if at all? If there has been a change, what has prompted this change?

B.6 Final Survey for Intervention Group

Default Question Block

When taking a moment to reflect on a period of time that you were working (whether it's the past hour or the whole day), you likely have a personal sense of how well you spent that time.

What are your personal criteria for defining whether or not your time is well spent during the work day? In other words, **how** would you define the concept of "Time Well Spent"?

How well do you generally spend your time at work?

- O Extremely well
- O Very well
- O Moderately well
- O Slightly well
- O Not well at all

What is your level of satisfaction with how your time is spent during your primary working hours?

- O Extremely satisfied
- O Somewhat satisfied
- O Neither satisfied nor dissatisfied
- O Somewhat dissatisfied
- O Extremely dissatisfied

Why?

What is your level of awareness of how **you spend** your workday? I.e. do you feel aware of what **activities** you are doing hour-by-hour?

- O Extremely Aware
- O Very Aware
- O Moderately Aware
- O Slightly Aware
- O Not Aware At All

What is your level of awareness of how **you feel** during your workday? I.e. do you feel aware of what **emotions** you are feeling hour-by-hour?

- O Extremely Aware
- O Very Aware
- O Moderately Aware
- O Slightly Aware
- \bigcirc Not Aware At All

Off the top of your head, list at least 5 activities that you feel to be spending your time well during the workday?

Off the top of your head, list at least 5 activities that you feel to be **NOT** spending your time well during the workday?

Block 1

Take a moment to look at the differences between these two response sets.

Initial Survey:
\$ {e://Field/init_tws}

Mid-Study Survey: \$ {e://Field/mid_tws}

Today: \${q://QID2/ChoiceTextEntryValue} How has your definition of **Time Well Spent** changed in the past 2 weeks, if at all? If there has been a change, what has prompted this change?

Take a moment to look at the differences between these **two lists of activities** that you consider to be **spending your time well**.

Initial Survey:
\$ {e://Field/init_pos}

Mid-Study Survey: \${e://Field/mid_pos}

Today: \${q://QID7/ChoiceTextEntryValue}

How has your list of activities changed in the past 2 weeks, if at

all? If there has been a change, what has prompted this change?

Take a moment to look at the differences between these **two lists of activities** that you consider to be **NOT** spending your time well.

Initial Survey:

\${e://Field/init_neg}

Mid-Study Survey:

```
${e://Field/mid_neg}
```

Today:

```
$ {q://QID8/ChoiceTextEntryValue}
```

How has your list of activities changed in the past 2 weeks, if at all? If there has been a change, what has prompted this change?

Block 3

Did you continue to use the tracking tool?

O Yes

O No

In this study, we are *most interested* in learning about how the **process** of reflecting and seeing an overview of the way your time is spent helps you. *Secondarily*, we are interested in getting feedback on the **tool** we provide (the combination of the **tracking app** and **visualization website**).

By using this **process**, what did you learn about the way you

Was this **process** of self-reflection on your time at work helpful? What insights did you gain from it?

How has the **process** of using the self-reflection tool made a difference in the way *you feel* your time is spent, if at all?

How useful was the **tool**?

- O Extremely useful
- O Very useful
- O Moderately useful
- O Slightly useful
- O Not at all useful

How often or how many times did you look at the visualization website over the last 2 weeks?

What would you like to have seen on the **visualization website** that is not currently possible to see?

What improvements would you like to see made to the **app** and

Please feel free to leave any comments about your experience with the **app** and **visualizations** below.

During the last two weeks have you used any other time management softwares or techniques?

Block 2

What is your gender?

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B.7 Final Survey for Control Group

Default Question Block

When taking a moment to reflect on a period of time that you were working (whether it's the past hour or the whole day), you likely have a personal sense of how well you spent that time.

What are your personal criteria for defining whether or not your time is well spent during the work day? In other words, **how** would you define the concept of "Time Well Spent"?

How well do you generally spend your time at work?

- O Extremely well
- O Very well
- O Moderately well
- O Slightly well
- O Not well at all

What is your level of satisfaction with how your time is spent during your primary working hours?

- O Extremely satisfied
- O Somewhat satisfied
- O Neither satisfied nor dissatisfied
- O Somewhat dissatisfied
- O Extremely dissatisfied

Why?

What is your level of awareness of how **you spend** your workday? I.e. do you feel aware of what **activities** you are doing hour-by-hour?

- O Extremely Aware
- O Very Aware
- O Moderately Aware
- O Slightly Aware
- O Not Aware At All

What is your level of awareness of how **you feel** during your workday? I.e. do you feel aware of what **emotions** you are feeling hour-by-hour?

- O Extremely Aware
- O Very Aware
- O Moderately Aware
- O Slightly Aware
- \bigcirc Not Aware At All

Off the top of your head, list at least 5 activities that you feel to be spending your time well during the workday?

Off the top of your head, list at least 5 activities that you feel to be **NOT** spending your time well during the workday?

Block 1

Take a moment to look at the differences between these two response sets.

Initial Survey:
\$ {e://Field/init_tws}

Mid-Study Survey: \$ {e://Field/mid_tws}

Today: \${q://QID2/ChoiceTextEntryValue} How has your definition of **Time Well Spent** changed in the past 2 weeks, if at all? If there has been a change, what has prompted this change?

Take a moment to look at the differences between these **two lists of activities** that you consider to be **spending your time well**.

Initial Survey:
\$ {e://Field/init_pos}

Mid-Study Survey: \${e://Field/mid_pos}

Today: \${q://QID7/ChoiceTextEntryValue}

How has your list of activities changed in the past 2 weeks, if at

all? If there has been a change, what has prompted this change?

Take a moment to look at the differences between these **two lists of activities** that you consider to be **NOT** spending your time well.

Initial Survey:

\${e://Field/init_neg}

Mid-Study Survey:

```
${e://Field/mid_neg}
```

Today:

```
$ {q://QID8/ChoiceTextEntryValue}
```

How has your list of activities changed in the past 2 weeks, if at all? If there has been a change, what has prompted this change?

Block 2

How old are you?

What is your gender?

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