Patterns of Meaningful and Meaningless Smartphone Use: A Diary Study

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Smartphones are highly popular, addictive everyday items which have raised concerns about over-dependency. This has led to a wealth of research on smartphone overuse albeit exploration of how habitual or phone overuse contrasts with purposeful or more meaningful use has been limited. To address this gap, this paper reports a one week diary study with 20 users. Findings highlight the distinction between pragmatic and eudemonic activities supporting meaningful use, and of hedonic activities associated with habitual use. We suggest a more nuanced conversation of habitual and meaning smartphone use. We conclude with two design implications including support for pragmatic experiences augmented with hedonic content and support for meaningful use rather than limiting meaningless use.

Smartphone addiction, Smartphone usage, Meaning, Digital Wellbeing, Eudaimonia, Meaningfulness

1. INTRODUCTION

The rapid advancement and adoption of smartphone applications has led to both positive and negative impact on everyday pattens of use. People, particularly millennials, tend to use smartphones out of habit and may struggle to control their smartphone use, resulting in habitual smartphone use which is difficult to revert (Roffarello et al., 2021). While much research both in HCI and other disciplines has focused on phone overuse, the exploration of both habitual and meaningful phone use has been less explored. We define meaningful phone use as the desirable, hedonic or eudaimonic phone activity involving purposeful selective use by each user. We focused in particular on the following research questions:

- Are there different smartphone usage patterns underpinning habitual versus meaningful smartphone use?

- What motivations underpin habitual versus meaningful smartphone use?

- What novel design implications can better support smartphone use?

We report a one week diary study with 20 participants to explore their patterns and motivation for smartphone use. Findings indicate the distinction between pragmatic and eudemonic activities underpinning meaningful use, and of hedonic activities triggered by boredom or procrastination, and commonly associated with habitual use.

Findings also suggest the importance of prioritising and filtering for strategies to engage in meaningful activities, and the fluid boundaries differentiating meaningful from less meaningful phone-based interactions. We conclude with several design implications such as supporting pragmatic experiences augmented with hedonic content, and meaningful use rather than limiting meaningless use.

2. BACKGROUND

We draw from the large body of work on smartphone overuse both in HCI and beyond, as well as from the growing HCI work on meaningful experiences.

2.1 HCI Research on Phone Overuse

Smartphone overusers tend to use their phone unconsciously in that they may be used it out of a habit (Kühn et al., 2019). They, the smartphone overusers, usually tend to have an urge to check their phones and may become anxious, socially isolated, and depressed if they have no access to their devices (Harwood et al., 2014). There is awareness among smartphone users of this problematic issue which is associated with a desire in reducing usage (Xu et al., 2022). However, still there is a gap in research to make smartphone use a more conscious activity (Roffarello & De Russis, 2019). Examples of habitual smartphone use include passively browsing social media or watching

entertainment, which has been shown less intentional and perceived as meaningful (Lukoff et al., 2018). Habitual users perform actions automatically and often compulsively, leading to a perceived loss of autonomy and mixed emotions (Lukoff et al., 2018). Similarly, smartphone overuse is associated with emotional instability and manifestations of anxiety, depression, hopelessness, sadness, and worry (Extremera et al., 2019; Kim & Kang, 2018). Moreover, smartphone users have individual preferences regarding their digital interactions, which means that smartphone use is context-dependent and varies by user. This explains why, for example, the intensity of smartphone usage alone is not sufficient to predict negative effects such as low emotional well-being (Katevas et al., 2018). As a result, addicted smartphone users are often dissatisfied with their relationship with the technology. Around 60% of habitual users wish to reduce their smartphone use, particularly the time spent using 'draining' apps such as Facebook, to increase their confidence and productivity (Hiniker et al., 2016; Ko et al., 2015). However, addicted users struggle to reduce their smartphone use as they feel unable to disrupt existing usage patterns, even with the support of targeted techniques and dedicated apps (Lee et al., 2014; Roffarello et al., 2021).

Habitual use has been also associated with immediately enjoyable activities such as entertainment, or social interactions (Griffioen et al., 2021; Singh & Samah, 2018). However, habitual use naturally tends to increase over time particularly concerning communication and social apps (Ding et al., 2016). As a result, habitual actions such as passively browsing social media or watching entertainment are performed automatically and often compulsively, and are generally less meaningful than active, intentional actions (Lukoff et al., 2018).

Much research has focused on technological overuse (Harris et al., 2020; van Velthoven et al., 2018), particularly of smartphones due to their benefits and yet highly addictive nature (Ding et al., 2016; Hiniker et al., 2016; Jeong et al., 2016). An important concept here is digital wellbeing emphasising the subjective, dynamic nature of smartphone use, according to which overuse reflects a problematic excess with negative impact on users' wellbeing (Burr et al., 2020; Roffarello and De Russis, 2019; Vanden Abeele, 2021). Harris et al. (2020) reviewed the impact of problematic smartphone use on both mental and physical wellbeing, while Király et al. (2020) compared the 'healthy' use of technology 'when pursued in moderation and for meaningful purposes' (p.2) to the 'excessive engagement' with video gaming, social media, and online shopping which increases the risk of 'disordered or addictive use' (p.2).

Smartphone overuse has also been associated with mixed emotions (Lukoff et al., 2018) and emotional instability manifested through anxiety, depression, hopelessness, sadness, and worry (Extremera et al., 2019; Kim & Kang, 2018). Furthermore, addicted users may experience tactile or audio-visual hallucinations from the Phantom Vibration (or Ringing) Syndrome, which can develop as a result of a growing Fear of Missing Out (FOMO) on information or experiences (Deb, 2015).

Smartphone overuse also has social implications with negative influence on social norms (Lanette et al., 2018), contributing to distracted parenting, inattentive pedestrians, and limiting in-person interactions. Crucially, it raises the average phone usage expected from individuals to complete work and fully participate in society, thereby pushing users to increase their smartphone use to avoid feeling 'disconnected' (Lanette et al., 2018).

In HCI, smartphone overuse has been also explored in the context of digital wellbeing focusing on digital interventions for limiting it. A review of 39 commercial and 17 academic digital wellbeing apps indicate that there is a disadvantage in the design of the available digital welling apps in regard to limiting use (Almoallim & Sas, 2022). The disadvantage is that the contemporary digital wellbeing apps tend to ignore the wider purposes of using smartphones. Therefore, they conclude with the need to move beyond meaningless interaction and rather supporting meaningful interactions. Lyngs et al. (2019) reviewed 380 apps and extensions (96 from Google Play, 60 from the App Store, and 224 from the Chrome Web store). The apps included were only the ones designed to help people self-regulate their digital device use. Blocking distraction or removing user interface features were the most common approach used in digital self-control. The authors grouped design features into clusters, and they found that most common approaches were related to block/removal, self-tracking, goal advancement, and reward/punishment respectively.

Smartphone use can be measured through screen time, screen unlocks, app launches, number of calls, call lengths, or any combination of these and other factors (Katevas et al., 2018). As smartphone users have individual preferences regarding their digital interactions, smartphone use is context-dependent and varies by user. This explains why, for example, the intensity of smartphone usage alone is not sufficient to predict negative effects such as low emotional well-being (Katevas et al., 2018). Similarly, smartphones are an important, positive daily feature for many users, so it has been argued that digital wellbeing features are more effective than abstinence in improving user wellbeing and quality of life (Cecchinato et al., 2019).

2.2 Meaningful Smartphone Use

In contrast to habitual phone overuse, meaningful smartphone use has been described as 'aware' use (Sela et al., 2022) or 'active' or 'intentional' use (Stepanovic et al., 2022). Meaningful use is achieved when the user has a clear aim or intention which can be realised through a productive task, such as taking notes (Roffarello et al., 2021). The user may feel competent upon completing the task and experience positive feelings of hope, joy, and satisfaction (Sela et al., 2022). Meaningful use can also occur when a smartphone is consciously used to 'micro escape' negative emotions such as anxiety, stress, frustration, annoyance, or boredom (Lukoff et al., 2018). However, this approach is not universal: other users may employ different emotional self-regulation strategies such as disabling app-specific notifications or avoiding smartphones altogether.

Unlike habitual use, HCI research on meaningful smartphone use has been less explored. However, within the third wave HCI, there is an increasing body of HCI research on meaningful user experiences, albeit less leveraged in the context of phone use. Significant in this respect is the Framework of Meaning developed by Mekler and Hornbæk (Mekler & Hornbæk, 2019). The framework presents the user experience of meaning as a quality of interaction, where meaning is deconstructed into five components: (i) the experience of meaning, (ii) purpose or sense of direction towards clear ends and future events, (iii) coherence as the extent to which one's experiences make sense or fails to, (iv) resonance as the immediate, unreflected experience of something making sense, without the need to reflect on, and (v) significance as aspects perceived as important and enduring. Through this framework, we view meaningful and meaningless smartphone as desirable and undesirable, respectively. The latter is often associated with habitual phone use, and while habitual use and overuse of smartphones have been much discussed (Kim et al., 2019; Ko et al., 2015; Roffarello et al., 2021), their exploration alongside meaningful phone use has been limited. To mitigate these limitations, qualitative data is collected from the participants through a diary study.

3. METHOD

This study explores users' perception of meaningful and meaningless smartphone use. 'Meaning' is defined as a subjective experience as per the Framework of Meaning (Mekler & Hornbæk, 2019). We report in this paper initial findings from part of a larger study, by focusing on one week diary study through which we captured participants' patterns of smartphone use, their motivations and perceived value.

We recruited 20 participants (14 male, 6 female; between 19 and 40 years of age (average 25.95))

through a convenience sample, with most participants being university students. During the diary study, participants used SPACE app, a digital wellbeing app which captures information about daily phone usage, complemented by a brief online questionnaire they were asked to complete each day for at least one interaction with each of the apps they used that day. The diary study covered the start and end times of the app use, what the participants sought (e.g. enjoyment, relaxation, alleviating boredom), and how they felt immediately after using the app (e.g. excited, guilty, bored). The diary study also included open questions about triggers for using specific apps, and about personal value from using them such as learning, social connectedness or supporting one's goals.

For data analysis, we employed descriptive statistics for quantitative data and thematic analysis for qualitative data.

4. FINDINGS

Findings indicated that connectedness, coordination, functional purposes such as work, information needs, and self-development were among the participants' meaningful uses of smartphone. In contrast to meaningful use, habitual smartphone use was due to stress, and boredom.

4.1 Patterns of Smartphone Use

On average, participants reported 7.7 app interactions, ranging in numbers between 3 and 17. Most interactions took place between 6:00am and midnight, lasted under 5 minutes, for instance in the case of WhatsApp the purpose was to "*deliberately reply to messages left*" [P9], or to record one's meal in MyFitnessPal app taking less than 2 minutes [P4]. Similarly, nearly all interactions with email apps were short (under 10 minutes) and deliberate, driven by the aim "*to check emails*" [P6].

Other apps were also used deliberately, albeit for longer periods: OneNote was used for 45 to 60 minutes per session to work on a "*maths assignment*" and for "*workshop notetaking*" [P18]. Another example is Google Maps, which was used deliberately for 1 hour and 20 minutes for "travel" purposes [P14]. However, several apps with traditionally hedonic connotations were also used for long periods. Facebook was used for around 30 minutes as an automatic "wakeup habit" [P18], however, it was also browsed for 30 minutes "*deliberately by a specific intention to check the marketplace*" [P11]. Similarly, YouTube was used for long periods with both hedonic and pragmatic aims. The app was used for 30 minutes to "d*eliberately view some videos*" [P6] but also for 30 minutes while "*snoozing in bed and being lazy*" [P17]. P18 reported opening the app to watch a

video sent by a friend but "*ended up watching a few more videos than intended*", extending app use to one hour. Similarly, others opened Twitter in response to a notification but "*after checking it I just started scrolling the news feed*" [P2].

Several other social apps were used for long periods. Instagram was used for 20 to 30 minutes [P4, P12, P19], and these interactions were mainly hedonic and automatic, triggered by "*an internal cue to go and just look at what people are doing*" [P12]; "*I wanted some content to mindlessly enjoy while waking up*" [P3]. Twitter was also mainly used for hedonic purposes, although one participant used it pragmatically for 30 minutes while: "*looking at trading*" [P18].

Another key finding is that most participants used their phones without seeking a specific aim (Figure 1), and as a result, about half of them did not learn new knowledge from using the apps.

Less than half of participants were also surprised by the amount of time they spent on each of their apps, and believed that this knowledge will impact their phone use. In particular, many were surprised by their excessive use of social medial apps: "*I do not recall using Messenger for 42 minutes, so it was surprising*" [P2]; "*Twitter! An hour in total on Twitter again, I really don't realise how long I'm on it for*" [P12]. Several participants [P16, P18, P20] also reflected on their number of phone unlocks, noting that it was higher than expected and that it should be reduced. In particular, one participant mentioned that they should reduce unlocks to prevent meaningless app overuse: "*Yes, trying reduce the time to unlock the phone, because each time I open the phone I found myself looking at notification and react to some apps like WhatsApp and Facebook*" [P11].

4.2 Meaningful Smartphone Use: Connectedness, Functional, Self-development

Participants indicated the following motives for their meaningful use of smartphones: connectedness, coordination, and functional or pragmatic purposes such as work/productivity or getting things done, information needs, and learning and self-development.

With respect to connectedness, findings indicate that most participants felt that their app use has made them feel connected to either the self or the world. Many participants use smartphones to communicate and keep connected to friends and family usually via chat apps such as WhatsApp "*to see messages and texting friends and family*" [P11], in order to "*know what my friends are up to and might join them*" [P5], WeChat app "*need to chat with friends*" [P8], or MS Teams "*certainly assists in connecting me to colleagues across the globe, which I think is important*" [P16], but also social

media apps such as TikTok "*sometimes seeing TikToks from my friends or other people in my close community*" [P2]. Often mentioned reasons include speed and accessibility: "*it makes it easy to connect with family and friends on the go*" [P16].

Connectedness was also supported by coordination of social events: "*I have purposely made arrangements for upcoming events*" [P9]. Coordination also involved updates from colleagues and was often achieved through the use of Outlook app "*it reminds me of my schedules for the day, and I get important updates from colleagues and supervisors regarding my work*" [P9], and Gmail app "*I learnt new updates from colleagues working in the office*" [P15].

Functional or pragmatic purposes supported work and productivity or getting things done through apps such as Email and MS Teams: "*I had some emails sent to me from work, so I needed to check them*" [P3], "*at least I am aware of any update from work*" [P16]. MS Teams and email apps were described as apps supporting the gathering of important information: "*checking my email and messages on Teams is important as I received notifications that are relevant to my work*" [P16]. Similarly, Chrome and Mail apps were described as a means to gather important information: "*intention to search some topics online*" [P11], "*need to find information for a day trip*" [P5], "*a deliberate use of the app to check for information*" [P9]. It was also remarked that certain apps such as Facebook and Chrome help in gaining new knowledge "*to know new knowledge and understand the trends and issues in life*" [P11].

Related to functional purposes, people also reported organising curating collections of photos "having a refined collection of pictures is kind of important for myself" [P20], or completing travel arrangements on booking apps.

Another motive associated with meaningful smartphone use was self-development. Participants mentioned things such as leaning a new language using for instance Duolingo app "*I just wanted to do some language studying*" [P2], "*I'm getting better at using a specific auxiliary verb in Russian*" [P7], or attending workshops online using MS Teams to develop research writing skills "*I have improved quiet significantly on writing research grants*" [P9]. Others mentioned using apps such as MyFitnessPal to track "*health macros*" and "*meals*" [P4], or listening to audiobook as means towards "*preparing for bed*" [P19].

4.3 Meaningless Smartphone Use: Stress & Boredom

Participants mentioned two main negative emotions underpinning habitual, meaningless use: stress and boredom. Boredom was frequently mentioned: "*I was bored and decided to check Facebook for any*

news" [P10]; "*I was bored and wanted to scroll on my TikTok feed*" [P7]; "*I was quite un-purposely browsing through the app just to pass time and alleviate boredom*" [P10].The smartphone was also described as a means to manage stress by watching videos on TikTok in order to "*release stress after exam*" [P3]. Similarly, other answers reflected FOMO (Elhai et al., 2018): "*I had too many notifications on the app, so it was time to use it*" [P17]; or as mentioned by another participant: "*I saw a bunch of message notifications and decided to check them out*" [P10].

The need for stimulation is also relevant when people wish to take breaks from cognitively demanding contexts: "*TikTok is usually my go to app for when I am taking a study break*" [P2].

Similarly, other answers emphasised the use of communication apps as a way for self-comforting: "*I get recharge and feel good when talking to my parents and brothers*" [P11]. In such situations, the phone becomes a tool for seeking out social connectedness in "*communication with family allowed me to be more attentive when speaking to then and more alert due to video call*" [P14]. This can occur in a compulsive way, reflecting FOMO on rewarding experiences (Elhai et al., 2018): "*I got a Facebook notification that somebody had liked a photo and I wanted to see who it was*" [P7].

Participants also commented on smartphone overuse due to checking the phone out of habit, and for no specific reason "*this interaction was out of habit and the experience doesn't make any sense to me*" [P20]; "*habitual social media when wakeup*" [P18]. In addition, using specific apps such Facebook occurs "*automatically*" [P5] as a way of "*procrastination*" [P5], though the task that participant procrastinate on was not mentioned. Such procrastination can be a predictor of sensitivity to boredom or a way to experience pleasure in stressful situations e.g., deadlines (Wang et al., 2019).

Boredom was another emotion leading to habitual phone use, often during idle periods of time involving waiting for something or situations with limited stimulation, in contexts such as being "*bored on a car ride*" [P19], "*to pass time"* [P10], from when users wake up in the morning *"wakeup, social media, get out of bed*" [P18] until before falling asleep "*I need to relax before bed, it is almost habitual at this point and was not really triggered by any one specific thing*" [P2]. Users' most common approaches to regulating boredom include scrolling "*I was bored and wanted to scroll on my TikTok feed*" [P7]; "*I was bored and decided to scroll through my apps*" [P10], playing games "*was bored and wanted to play a game*" [P13], and checking social media "*I was bored and decides to check Facebook*" [P10], and communicating with friends "*I was bored, so I*

decided to send a photo to my friends to see what they are doing*" [P10].

The need for stimulation is also relevant when people wish to take breaks from cognitively demanding contexts: "*TikTok is usually my go to app for when I am taking a study break*" [P2]; *"take a break when I'm tired of learning*" [P8]. The challenge here is keeping such breaks within desired time limits. However, scrolling often lacks clear intention "*I will try to turn to an alternative phone use when I find myself about to scroll through Twitter*" [P12]. Such scrolling is also problematic given the amount of time people spent doing it "*it was mostly mindless scrolling, and I didn't put much thought in it*" [P10].

5. DISCUSSION

We conducted a diary study to investigate what smartphone users consider to be meaningful and meaningless smartphone interactions. Overall, the findings have highlighted a more nuanced understanding of smartphone overuse. The identified themes indicate specific differences between the motives underpinning meaningful and meaningless use of smartphones. In addition, it highlights that the distinction between meaningful and meaningless smartphone use can be blurred at times, being context dependent.

5.1 Meaningful and Meaningless Use

Findings indicate that meaningful use is supported by the need for social connectedness through communication with close ones, and activities related to "doing work". In contrast, meaningless use was often about negative emotions such as stress and boredom, which can lead to procrastination, and spending more time on social media after the intentional, meaningful use has ended.

While the meaningful use of smartphone for communication is aligned with those form previous work. our findings also highlight the importance of pragmatic activities for meeting other important needs such as chores or work.

With regard to the former, communicating with others was previously described as "probably the most meaningful task" irrespective of the app used (Lukoff et al., 2018, p.11). In terms of the latter, our empirical outcomes echo those from the theoretical HCI work previous work, where meaningful use of smartphones was associated with planned, purposeful activities (Griffioen et al., 2021; Singh & Samah, 2018), Functional, planned activities are likewise meaningful: scheduling work, connecting with colleagues, gathering important information, organising collection of photos, and researching specific topic. These activities are meaningful as they are underpinned by a sense of "purpose" (Mekler & Hornbæk, 2019) such as achieving a

specific goal, deemed important. Such personally relevant goals can benefit from tailored support as emerging HCI work has argued (Lolla & Sas, 2023).

In addition, meaningful smartphone use also related to productive self-development tasks which have personal "significance" (Mekler & Hornbæk, 2019) such as logging workouts or meditating (Akama et al., 2017; Lukoff et al., 2018). The growing HCI research on mindfulness technologies (Daudén Roquet et al., 2023; Daudén Roquet & Sas, 2021; Terzimehić et al., 2019) and particularly on mobile apps offers strong support for meaningful use (Roquet & Sas, 2018).

In contrast to meaningful use, meaningless use results from habitual actions such as mindless scrolling and compulsively checking apps (Hiniker et al., 2016; Lukoff et al., 2018). Mindless app scrolling and social media browsing are commonly caused by boredom and procrastination (Cho et al., 2021; Lukoff et al., 2018; Meier, 2022). Stressful situations such as arguments can also cause meaningless use as meaningful "micro escapes" (Lukoff et al., 2018) may turn into habitual scrolling or unconsciously hopping between features (Cho et al., 2021).

5.2 Eudemonic and Hedonic Smartphone Use

Participants indicated several motives for meaningful use of smartphones including connectedness, coordination, and functional or pragmatic purposes, information needs, and learning and self-development. On the other hand, stress and boredom were the main negative emotions highlighted by participants which lead to meaningless use.

Meaningful smartphone use is associated with pragmatic (instrumental) use, which is characterised by perceived usefulness in the pursuit of goals (Merčun & Žumer, 2017). It is also linked to eudemonic use, which refers to the pursuit of meaning and personal ideals such as excellence to ultimately achieve long-term happiness (Mekler & Hornbæk, 2019). By contrast, meaningless smartphone use reflects non-instrumental, hedonic use, which emphasises the achievement of goals such as short-term happiness, pleasure, and relaxation (Mekler & Hornbæk, 2019; Merčun & Žumer, 2017). The eudemonic-hedonic perspective is increasingly relevant in the development of smartphones, apps, and design friction as intrinsic considerations – particularly hedonic motivations – strongly influence smartphone use (Busch, 2020). For example, the delivery of hope via smartphone notifications was found to increase both hedonic (short-term) and eudemonic (long-term) well-being (Daugherty et al., 2018). Although hedonic smartphone use can have positive short-time effects, this study found it is generally associated with meaningless use, so the design of microboundaries to deter smartphone overuse should focus on promoting eudemonic well-being.

Based on the data collected during the diary study, "practical" apps such as OneNote, MS Teams, and Duolingo have positive pragmatic connotations and are typically used in the pursuit of clear goals. Several participants reported using these apps to achieve specific purposes such as developing their skills or learning something new.

Several habitual triggers fell into the hedonic category: "stress", and "boredom". Meaningless use also resulted from positive, pragmatic activities when they are then taken over by more positively hedonic experience. Comparing this with previous research, Merčun and Žumer (Merčun & Žumer, 2017) reported positive user experiences as being more often associated with pragmatic aspects (organised, useful, efficient, etc.) and negative experiences with poor hedonic ratings (busy, frustrating, complex, etc.). The comparison is shown in Table 1 in Appendix.

5.3 FOMO and Other Motives for Smartphone Overuse

Participants noted that they frequently checked their phones to ensure important notifications are not missed (the FOMO effect). This addictive pattern could be because of the variety of the apps available and their various features as opposed to basic or "classic" functionalities for using the phone (Salehan & Negahban, 2013).

There could be an impairment of control in using social media as a result of FOMO (Fioravanti et al., 2021). FOMO is triggered by the anxiety of being excluded from one's social group and missing out on social connectedness. While connectedness is sought after as a meaningful endeavour, FOMO is a maladaptive behaviour of compulsively and counterproductively engaging with the phone, particularly with social media.

The diary study showed that several participants felt compelled to check their phones after receiving irrelevant notifications.

These findings mirror those of similar studies on FOMO and Need to Belong (NTB). Disabling smartphone notifications can make users with high FOMO and NTB even more afraid of missing important or emergency information (Yoon & Lee, 2015), leading to more frequent, compulsive smartphone checking. A similar study found that users check their smartphones for new notifications more often when the smartphone is in silent mode compared to the audio or vibrate modes (Liao & Sundar, 2022). Again, it was noted that users with high FOMO and NTB are more likely to be psychologically distressed by the silent mode and compulsively check their smartphones.

5.4 Meaningful and Meaningless Use: Dynamics & Context- dependent

In important outcome from our study was the dynamics of specific interactions which although they started as meaningful, through extended engagement, they risk becoming less so, such as prolonged conversations with loved ones, or searching for information when people can become easily distracted. Such outcomes emphasise the purposeful effort required to maintain meaningful interactions, some of which are at risk of slipping into their habitual counterparts. Our findings echo previous ones where participants indicated they used smartphones longer than intended (Harris et al., 2020)

More research is needed to understand such at risk interactions and how to better design for them to better support their meaningful enactment.

In terms of context, our findings show that interactions with a specific app can be perceived at some times as meaningful and at others as meaningless, depending on the intention or purpose, the extent of time engaged in interaction, which in turn can impact the associated emotional experience associated with it.

Of the reactions in the context of meaningful and meaningless use, for meaningful, keeping in touch had both hedonic and eudemonic attributes, with connectedness to friends and family. Other than this, the remaining contexts were strongly on the pragmatic side: messaging colleagues on MS Teams, learning, organising photos, communication with loved ones, or searching for information. These findings are consistent with the literature, where purposeful browsing and planned social interactions have been associated with meaningful, positive experiences (Griffioen et al., 2021; Singh & Samah, 2018). On the non-meaningful negative side, there is a bias toward hedonic momentary satisfaction in constantly checking for new messages, using the phone to pass time while traveling and scrolling on social media. The was little mention of more pragmatic-oriented meaningless interactions. Conversely, meaningless use followed hedonic activities on social media such as using TikTok for much time and increase use of Snapchat.

6. DESIGN IMPLICATIONS

We now discuss three design implications informed by our findings.

6.1 Supporting Pragmatic Experiences Augmented with Hedonic Content

This research indicates that meaningful smartphone use is rooted in pragmatic or functional motives, for which hedonic elements can be contributory,

whereas meaningless use is associated mostly with hedonic activities. One can reflect that since mobile phones are primarily communication devices, using a phone for "connectedness" is both pragmatic and hedonically satisfying (because it was designed for it). These outcomes are important suggesting the value of supporting meaningful use towards functional motives which ideally would also have embedded by design hedonic element.

6.2 Supporting Meaningful Use rather than Limiting Meaningless Use

Findings showed that participants did not often identify hedonic experiences, often associated with good user experience, as being meaningful, nor did they report negative pragmatic experiences, as being meaningless. They did however report hedonic experiences as being by large meaningless. Such decoupling of hedonic from meaningful experiences is important, and we suggest that while the design for meaningful experiences may benefit from the HCI research on user experiences, we argue that it may also require a step change in how we design interaction, and stronger theoretical underpinning such as that provided by the Framework of Meaning (Mekler & Hornbæk, 2019).

Our outcomes extend those from Merčon and Žumer (Merčun & Žumer, 2017) study, which shown that people associated meaningful smartphone use with pragmatic aspects while exploring positive or negative and hedonic or pragmatic characteristics of user experience. In particular, their work strongly associated good user experience with hedonic aspects, and bad user experience with negative pragmatic ones. However, this association contrasts with the present research.

Further research may explore the relationship between poor user experience and meaningful smartphone use. In addition, given the contextual nature of meaningful use, advances in machine learning and semantic modelling (Najar et al., 2011) offer the possibility to exploit improved understanding and use this for the next generation of 'screen time' applications. They offer the possibility of better and more effective targeting of design friction and behaviour-change interventions for smartphone overuse based on the filtering and selectivity preferences of users.

7. CONCLUSION

Smartphone overuse is increasingly associated with negative health impacts and societal issues. Habitual, meaningless use keeps increasing despite the extensive efforts to encourage meaningful use. This paper reports a one week long diary study to examine what users consider to be meaningful and meaningless smartphone interactions. Participants'

responses show that meaningful smartphone use typically originates from eudemonic, pragmatic activities such as purposeful learning and connectedness. Conversely, meaningless use resulted from hedonic activities caused by boredom or procrastination, and meaningful but overrunning actions which led to overuse. These findings represent informed two new design implications supporting pragmatic experiences augmented with hedonic content and supporting meaningful use rather than limited meaningless use.

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Appendix 1

Table 1: Topics and themes highlighting pragmatic and hedonic uses

Topic	Themes
Meaningful use	Social connectedness; functional purposes to get something done; study or work; quality-of-life: to research general issues or learning; information needs; learning or self-improvement
Habitual smartphone use – triggers	Stress; Fear of Missing Out; boredom; procrastination
Context of overuse	Fear of Missing Out; checking the phone out of habit for no specific reason; procrastination
Meaningless use	spending long time on social media; inappropriate or unnecessary times
Pragmatic / Eudemonic	Bookings; connectedness; learning and reading; keeping in touch; searching important information; receiving directions or incoming messages about a current event
Hedonic	Connectedness; checking for new messages; to pass time; scrolling on social media; keeping in touch; watching videos for hours; using the phone at inappropriate times; social media waste of time; stress; boredom
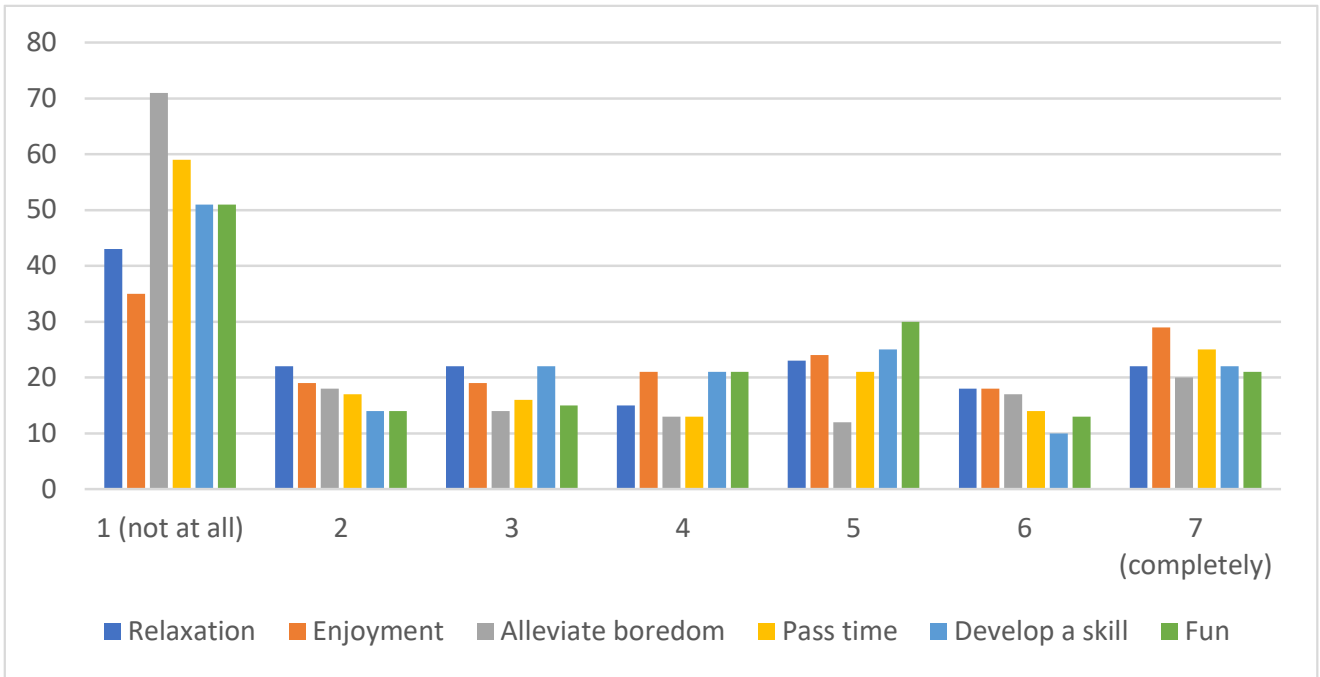
Figure 1: *Aims of smartphone use: relaxation, enjoyment, boredom, passing time, develop skills, fun*