

The Tale of a Complicated Relationship: Insights from Users' Love/Breakup Letters to Their Smartphones before and during the COVID-19 Pandemic

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Fig. 1. We asked participants to write a love or breakup letter to their smartphone to investigate their emotional bond.

Smartphones have gotten under public scrutiny due to their ostensible negative impact on users' well-being. Nonetheless, users and related work report positive aspects of smartphones, too. We investigated this discrepancy through the prism of the emotional user-smartphone relationship by having people write love/breakup letters to their smartphones. We gathered 82 letters – 42 before and 40 during the COVID-19 pandemic. We found a mixed nature regarding the distribution of love and breakup letters and associated emotions based on the revisited OCC-model of emotions – with a slight shift towards the negative emotional spectrum during the COVID-19 pandemic. Furthermore, we performed an extensive qualitative analysis of 819 user statements extracted from the letters, resulting in a connection of emotions to 17 smartphone features and eight themes of real-life consequences of smartphone use. We then identified eight common patterns of this connection, classified as *smartphone roles*. The collected letters mostly model a complex user-smartphone relationship, comprising different roles depending on users' inner and outer context. We discuss how HCI could help in shaping the complex user-smartphone relationship in future research and suggest supporting a healthy balance between users' daily life and smartphone use.

CCS Concepts: • Human-centered computing → Smartphones; Human computer interaction (HCI).

Additional Key Words and Phrases: smartphone use, emotions, OCC model, application space, love letters, thematic analysis

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1 INTRODUCTION

Since the introduction of the iPhone in 2007 [1], mobile phones have evolved constantly. What started as a simple communication tool primarily meant for calls and text messages, is now a personal smart device able to fulfill a plethora of different tasks. For example, smartphones can help nurture our social ties with messaging or social media apps, or monitor our health through diverse tracking apps. This happens at the tip of our fingers wherever and whenever we need it. Taking advantage of these benefits, there have been over 6,25 billion smartphone users in 2021 worldwide, with another 1,5 billion projected in the next five years [65].

Currently, almost half of smartphone users in the US spend between five and six hours daily on their smartphones [64]. Such trends have led to an increase in concerned voices about smartphones and behaviors associated with, e. g., excessive, problematic, meaningless, or addictive smartphone use, both in research and the media. As a consequence, several sources began to promote strategies to tackle and reduce "negative" smartphone use behavior, and even launched societal movements (e. g., digital detox).

However, there has been critique to these rigid restrictions. Related work points to an additional burden and a well-being decrease when using restrictive apps and methods [55]. Lanette et al. [36] note how the addiction story line is more a product of pervasive media coverage than true clinical pathology, i. e., we tend to "overpathologize" smartphone use [5]. Whereas negative narratives in the media influence people's perception of smartphone use [35], many smartphone users see their personal devices as indispensable and consider them important parts of their everyday lives [46] – sometimes even as part of their own self [15]. In fact, the role of a smartphone in a person's life is a constant interplay between its positive and negative sides [22], often with emotional consequences such as dependency and anxiety on one side [18] or stress-relief on the other [14].

Related work in HCI has set out to explore this ambiguity through the lens of meaning (i. e., meaningful, meaningless or pleasurable smartphone use [39, 43] respectively), uses and gratifications of smartphone use [26], or compulsive, habitual or regretful smartphone use [9, 58, 70]. The listed explorations evolve around the smartphone as a whole or on an app-(category) level *in isolation* from users' lives, i. e., they do not inspect how specific smartphone functions influence the users' everyday lives (e. g., using the smartphone's alarm to be woken up). Moreover, related work does not specifically consider which everyday consequences are associated with the use of certain smartphone features and how they influence the user emotionally. To better understand this relationship, a thorough analysis of users' emotions towards their smartphone, its features, and potential real-life consequences is needed. This in turn contributes to HCI by both understanding users' needs more profoundly as well as informing the design of, e. g., smartphone apps, use interventions or future ubiquitous technologies.

Furthermore, amid the COVID-19 pandemic, users have shifted more of their everyday life activities into the virtual world, rendering smartphones and other digital tools even more important to stay in touch with "the outside world". As a result, the time spent on smartphones during the pandemic has increased [54]. So far, there has been little investigation on how this shift affected the user-smartphone relationship and whether it is characterized by the same patterns of use as before the pandemic.

We frame our identified research gap with respect to the following three research questions:

RQ1: *Which patterns of user's emotions towards certain smartphone features and their possible consequences in everyday life describe the user-smartphone relationship?*

RQ2: *What strategies do people employ to navigate their relationship with smartphones in everyday life?*

RQ3: *How has the COVID-19 pandemic influenced the relationship between users and their smartphones?*

We investigated these questions by surveying people to write *love or breakup letters* to their smartphones. In two rounds, the first in 2018 and 2019 before COVID-19 (BC) and the second in 2022 during COVID-19 (DC), we analyzed 42 and 40 letters respectively. We performed a thorough, qualitative analysis of 819 statements, deduced from the 82 letters, using a manual coding process. The revisited model of emotions by Ortony, Clore and Collin (OCC model of emotions) [49, 66] served as a framework for our thematic analysis, consisting of emotions and related smartphone features, consequences of use and smartphone roles. Moreover, we carried out an automated sentiment analysis of the letters, underlining the results of the manual coding and showing the overall tone of the letters before and during the COVID-19 pandemic.

Our analysis revealed eight common, mutually non-exclusive, patterns of user-smartphone relationship. We classify these patterns as following *smartphone roles*: *assistant*, *companion*, *entertainer*, *hinderer*, *nuisance*, *object*, *obsession* and *villain*. These roles are deduced from 17 smartphone features (e. g., ubiquity, apps) and eight themes of real-life consequences (e. g., better quality of life, coping strategies) along the revisited OCC model of emotions. On one side, the roles *assistant*, *companion* and *entertainer* are mostly linked to positive user emotions, making users' lives easier and inducing a joyful level of attachment. On the other side, the roles *hinderer*, *nuisance*, *obsession* and *villain* are perceived rather negatively for causing worse well-being, disrupting the user's daily life and inducing an unhealthy dependency on the smartphone. The role of *object* can either be positive or negative, depending on whether it is perceived as an object of value or "just an object". Most letters are of mixed emotional nature comprising multiple roles since the patterns of use intertwine with different situations in the users' everyday lives. However, there was a slight shift towards the negative emotional spectrum during the COVID-19 pandemic. Finally, users blame themselves for negative patterns of use and see different degrees of disuse as a managing solution for the relationship.

We conclude by discussing the identified complicated user-smartphone relationship in three acts (situation, complication and resolution), along the potential role of HCI in shaping that relationship in the future. We suggest a move from a restrictive approach to managing the user-smartphone relationship to one that aims to support a healthy, personalized life-smartphone balance, in which both positive and negative identified features can find their place in the user's life, in the right amount.

We contribute with an in-depth qualitative analysis of 82 love or breakup letters describing users' emotional relationships with their smartphones. Using this exploratory approach, we identified specific smartphone features triggering positive or negative emotions and elaborate the corresponding consequences for real life. As result, we extracted eight patterns (*smartphone roles*) from the data that characterize the user-smartphone relationship and discuss their significance for HCI research. We round up the contribution by providing insights into the development of the emotional user-smartphone relationship before and during the COVID-19 pandemic.

2 RELATED WORK

2.1 (Emotional) User-Smartphone Relationship

People are predisposed to seek attachment to others – a recent study found that this attachment predisposition can spread to objects too [34]. It therefore seems natural that 79% of smartphone owners keep their phone with them almost all day long. One quarter of smartphone users do not remember the last time when their phone was further away than an earshot [7]. Metscherjakov et al. [46] developed a "*conceptual mobile attachment model*" bringing reasons, consequences, and influencing factors of mobile attachment together into perspective. They found that the user-smartphone relationship may be fostered when the smartphone "*empowers, enriches, or gratifies the user's self*". They list behavioral responses (i. e., proximity) and cognitive and emotional responses (e. g., fear and anxiety) among the consequences of such attachment. Konok et al. [34] investigated reasons behind some consequences of the attachment, such as proximity or social connection. Whereas all participants

considered the phone's proximity to be important, participants with an anxious attachment found in particular constant social contact over the phone to be important.

Fullwood et al. [17] examined users' relationship with their phones by means of the Uses & Gratification framework [28]. Findings included, among others, a branching in attitudes towards smartphones as materialistic objects on the one hand and anthropomorphic entities on the other; the evolution of smartphones from a communication tool to a tool for seeking information and entertainment on the go; a sense of safety when in unfamiliar or uncomfortable settings. Carolus et al. [8] investigated smartphone *companionship* and emphasize its ability to meet basic human needs for social connection and belonging [61]. Related research extends the view of the smartphone as a stand-alone companion and refers to it as pacifier in solitude [14] and even an "extension of the self" – both qualitatively [21] and quantitatively [19].

We aim at complementing the listed research in two ways: first, by identifying specific smartphone features and consequences of use to better understand existing models of attachment; second, our goal is to analyze the complex nature of the user-smartphone relationship. We therefore plan to investigate which emotions are induced by which smartphone features and which consequences are caused by certain features or emotions. Building on these patterns of use, we aim to gather a holistic understanding of the different parts of the attachment model.

2.2 The Ambiguity of Smartphone Use

Smartphones can be extremely convenient or problematic based on different use patterns. These two sides of smartphone use are yet to be understood holistically within HCI. Yet, their understanding is crucial if we want to support users in having a balanced relationship with their smartphones, and if designers aim to foster balance [8].

The Uses & Gratification framework [28, 59] differentiates between two motivations for media use: If motivated instrumentally, the user aims to achieve a certain intention by using technology. If motivated habitually, the user rather roams through the digital space without a clear intention of use. Hiniker et al. [26] have worked on predicting the different motivations. Whereas social media, games, or news satisfy ritualistic motivations, navigation, health tracking or social communication satisfy instrumental motivations. As the day proceeds, individuals seek more ritualistic, and less instrumental types of use. Building on top of these findings, Lukoff et al. [39] examined the two motivations through the lens of meaningful and meaningless [44] smartphone interactions, showing that unconscious, habitual smartphone interaction, as well as seek for an escape from reality reduce meaning. However, users do not always seek meaningful experiences: pleasurable experiences, e.g., sharing memes, can also be positively connoted [43].

Another study [41] differentiates between general and absentminded smartphone use. The authors found only absentminded use (e.g., compulsive checking, pointless scrolling, or other phone use without a specific purpose) to be closely linked to inattention in daily life.

Vanden Abeele [71] introduced the mobile connectivity paradox: mobile connectivity can both support user's autonomy (e.g., accessing information or a service) and challenge it "*when mobile technologies exert direct control over thoughts and behaviors by directing attention away from people's primary activities*". They call for a healthy balance between connectivity and disconnectivity in everyday life. According to current research, both designers and users themselves can disrupt the balance: the first by incorporating negative patterns in the interface design (see [47] for a recent review) and the latter by internally rooted habits [31, 50, 58], where the sole presence of smartphones disrupts their real-world presence [24, 27]. However, the smartphone's disruptiveness is seen differently depending on the real-world context of use [29, 71].

The habit paradigm is one reason why users themselves frame a narrative around the prevalent smartphone addiction storyline [35]. Yet, some researchers call out the media press for over-dramatizing [5, 23, 35]. Lanette et al. [35] invite HCI researchers to "*explor[e] the productive and positive ramifications of*" mobile devices, in

order to develop "*an accurate and compelling alternative narrative*". Accordingly, Funk et al. [18] contribute to the alternative narrative with four loving expressions: waiting, dependency, anxiety and absence.

We add to the discussion about this dualism by means of love or breakup letters, both contributing to a holistic understanding of the user-smartphone relationship, as well as an affective language towards mobile technology from the user's point of view.

2.3 Real-World (Dys)Function

Related research projects show that being reachable and able to access information can be a source of instant connection and constant distraction [32, 53]. Distractions caused by smartphones have eroded our ability to focus, e. g., in class [30, 45], at work [37] or in social settings [11, 33, 52]. Modern mobile technologies are typically designed to be appealing [20] due to the attention economy [10]. This can further result in "digital stress" [57], potentially even leading to depression and burnout [13, 56, 57]. Moreover, constant connectivity can negatively influence an employee's well-being due to the inability to disengage from work [6]. Permanent digital connectivity can also cause social digital pressure [25], fear of missing out (FOMO) [4, 75], or nomophobia, i. e., the fear of being without a mobile phone [74].

At the same time, there is much less systematic research focusing on positive life consequences than on the listed negative consequences. However, being reachable and able to access information gives the user a feeling of freedom and flexibility, satisfying the fundamental needs for human attachment [8]. For some, it is a way to escape the challenges of the "real" world and finding comfort and emotional safety in the digital world [51, 63]. In addition, mobile social communication in the context of an intimate couple was found to be positively related to the quality of the couples' relationship [48]. As one of the few projects synthesizing knowledge on both positive and negative consequences, Pancani et al. [51] developed the *Smartphone Impact Scale* as an evaluation method.

We contribute to this body of research by exploring both positive and negative real-world consequences of smartphone use in our analysis.

2.4 Smartphone Use in Times of COVID-19

A review of technologies that are being used during the COVID-19 pandemic [72] shows that mobile devices are omnipresent in all domains of "*COVID-19 life*", e. g., healthcare, work, education, and daily life. People use mobile devices, e. g., for contact tracking, accessing digital information, or teaching and learning. Above all, the smartphone is used for communicating with others due to social distancing. David et al. [12] suggest re-framing social distancing into "*physical distancing with social connectedness*", further emphasizing that smartphones play a crucial role in fostering social connection and thus positively influence users' well-being.

With offline activities being less available, people turned to the digital world for leisure, entertainment, or emotion regulation, causing a higher emotional dependency [68, 73]. Furthermore, as work obligations have also moved online, people experienced difficulties in maintaining a healthy work-life balance [73]. Teenagers reported increasing technology use during the pandemic, yet, the increase had "*less bearing [effect] on daily fluctuations in wellbeing than the satisfaction and meaning they derived from their technology use*", noting that they also considered technology as no proper replacement for live communication [54].

3 BACKGROUND

To investigate the emotional connection between users and (specific features of) their smartphone, we applied the methodology of "love letters" [40]. We first explain this methodological choice over more common qualitative research methods (e. g., interviews or online surveys). We then explain the OCC model of emotions and its fit for our analysis. We conclude the section with a definition of terms important for understanding the results.

3.1 Love Letters as Methodology

Martin et al. [40] describe the love letters methodology as “*writing [a letter] to express sentiments to a personified product or service*”, in order to both understand what creates moments “*of connection and delight*” with the product, as well as “*how, when, and where a relationship with [the] product turned sour*”. This way, researchers can gain meaningful emotional insights into how certain products and their features fit into peoples’ everyday lives [67]. Given the smartphone’s intimate nature [8], the methodology seemed eminently suitable for our study of the emotional relationship between users and their smartphones. Moreover, this method has proven to be an enjoyable approach and avoids the risk of overthinking by writing only a few paragraphs [40, 67]. As a consequence, an early dropout or confirmation bias is lower than in open-ended online surveys or interviews.

For example, McCarthy et al. [42] used this approach to acquire user requirements and inform the design of persuasive medical technologies. To the best of our knowledge, we are the first to use this exploratory approach to investigate and describe the broad and complex emotional relationship people have with their smartphones.

3.2 The (Revisited) OCC Model of Emotions

The ”Cognitive Structure of Emotions” Model by Ortony, Clore & Collins – the *OCC Model of Emotions* [49] – “*provides a model of eliciting conditions of [22 different] emotions and the variables that affect their intensities*” [66].

The model provides three classes of emotions towards (1) consequences of events (e.g., joy and pity), (2) actions of agents (e.g., pride and reproach), and (3) aspects of objects (e.g., love and hate). It also includes emotions regarding consequences of events caused by actions of agents (e.g., gratitude and anger). The notions of events, actions, and objects make the OCC model suitable for use in artificial agents [66] (in our case, for smartphones). As we implicitly assign a character to the smartphone by our choice of methodology, we found the model more fitting compared to the predominantly used circumplex model of valence and arousal by Russell [60]. Moreover, the circumplex model is rather used for human emotion prediction, than for emotion recognition in text.

We opt to use the revisited OCC model of emotions by Steunebrink et al. [66] (see Table 1), as it resolves several ambiguities in the original model by proposing new emotion type specifications for a total of 32 emotions and stressing the importance of consequences. We found this particularly useful for better distinguishing statements implying a consequence from those that do not.

3.3 Definition of Terms

The following terms contribute to understanding the remainder of this work, as they form the basis of our results and discussion:

- (1) **(OCC) Emotion:** predominant emotion based on the revised OCC model (see above)
- (2) **Feature:** any function or feature incorporated in the smartphone, e.g., “smartphone as a whole”, general or specific apps, or hardware, but also any other aspect associated with smartphone use (and identified within our data set), e.g., the user’s own smartphone use behavior or the ubiquitous nature of smartphones
- (3) **Consequence:** desirable or undesirable consequence of a feature or an event, usually related to the OCC emotions implying a consequence, e.g., the user feels *displeased* (emotion) because the smartphone’s *fragile hardware* (feature) causes *repair costs* (consequence)
- (4) **Emotion – Feature (– Consequence) Link:** logical connection/reasoning between emotion, feature and an optional consequence yielded by the coding of a single user statement
- (5) **Role:** specific role the smartphone takes on in the user’s everyday life, originated by clustering the identified emotion – feature (– consequence) links

Table 1. The revisited OCC model of emotions [66]. We used the model as a basis to code the participants' statements from the letters.

OCC Emotion	Description [66]
<i>positive</i>	valenced reaction (to "something")
<i>pleased</i>	being positive about a consequence (of an event)
<i>hope</i>	being pleased about a prospective consequence (of an event)
<i>joy</i>	being pleased about an actual consequence (of an event)
<i>satisfaction</i>	joy about the confirmation of a prospective desirable consequence
<i>relief</i>	joy about the disconfirmation of a prospective undesirable consequence
<i>happy-for</i>	joy about a consequence of an event presumed to be desirable for others
<i>gloating</i>	joy about a consequence of an event presumed to be undesirable for others
<i>approving</i>	being positive about an action (of an agent)
<i>pride</i>	being approving of one's own action
<i>admiration</i>	being approving of someone else's action
<i>gratification</i>	pride about an action and joy about a related consequence
<i>gratitude</i>	admiration about an action and joy about a related consequence
<i>liking</i>	being positive about an aspect (of an object)
<i>love</i>	liking a familiar aspect (of an object)
<i>interest</i>	liking an unfamiliar aspect (of an object)
<i>negative</i>	valenced reaction (to "something")
<i>displeased</i>	being negative about a consequence (of an event)
<i>fear</i>	being displeased about a prospective consequence (of an event)
<i>distress</i>	being displeased about an actual consequence (of an event)
<i>fears-confirmed</i>	distress about the confirmation of a prospective desirable consequence
<i>disappointment</i>	distress about the disconfirmation of a prospective undesirable consequence
<i>resentment</i>	distress about a consequence of an event presumed to be desirable for others
<i>pity</i>	distress about a consequence of an event presumed to be undesirable for others
<i>disapproving</i>	being negative about an action (of an agent)
<i>shame</i>	being disapproving of one's own action
<i>reproach</i>	being disapproving of someone else's action
<i>remorse</i>	shame about an action and distress about a related consequence
<i>anger</i>	reproach about an action and distress about a related consequence
<i>disliking</i>	being negative about an aspect (of an object)
<i>hate</i>	disliking a familiar aspect (of an object)
<i>disgust</i>	disliking an unfamiliar aspect (of an object)

4 METHODOLOGY

4.1 Procedure

We gathered the data for our study in two parts: the first set of letters were collected at an in-person event in December 2018 and continued online in spring 2019, i. e., before the outbreak of the COVID-19 pandemic (BC). The second part took place at the beginning of 2022, i. e., during the COVID-19 pandemic (DC). For the in-person part of the study, we created two paper templates – a love and a breakup letter – both giving the same instructions:

"Your task is to write a love or breakup letter to your smartphone. Tell the tale of how you got to use it, describe the reasons you love or hate it, explain why you can't live without it or would rather toss it out of the window (but somehow can't?). Reveal your expectations of it. Tell a story of when it positively or negatively surprised you..."

The templates also included demographic questions on age, gender, highest education level, profession, smartphone type, and OS version. We advertised the study among the visitors of our lab's open day, e.g., colleagues, their relatives, and people with a general interest in HCI research. A poster explained the procedure: Participants should (1) pick up the love or breakup letter template, (2) write the letter and fill out the attached

demography questionnaire, and (3) put the letter in an envelope and then into our “letter box”. They were rewarded for their participation with sweets.

To acquire a larger and more diverse audience, we continued the study in an online survey. We slightly adapted the methodology since the participants of the first part of the study found it hard to exclusively write a love or breakup letter. The survey participants therefore rated the letter’s overall tone (love, breakup, mixture of both, neither) **after** writing the letter. In addition, we set a minimum length of 250 characters for the letters.

In the second part of the study, we repeated the same procedure as in the online sample to gather letters written during the COVID-19 pandemic (see Figure 1 for the template used in the second part of the study). To examine the interplay of smartphone use and the pandemic, we added two open-ended text questions about users’ perceived influence of: (1) the pandemic on participants’ smartphone use and (2) users’ smartphone use on their everyday life during the pandemic.

Online participants could take part in a raffle for 20 Euro online shop vouchers. We distributed the survey link via social media and our university’s newsletter, including every volunteering participant into our study.

4.2 Participants

42 participants wrote a letter in the first part of the study (BC). The majority were female (32), and nine were male. One participant preferred not to disclose their gender. The participants were on average 28 years old ($SD = 8.9$). All of them had an academic background: 31 participants already held a university degree (Bachelor’s, Master’s or PhD) and the other eleven currently pursued one. 25 participants disclosed using an Android smartphone, 16 an iPhone, and one participant owned a “Fairphone”. All of them stated to use their smartphone on a daily basis (at least 0.5 hours a day).

40 participants took part in the second part of the study (DC): 25 female, 13 male and two who preferred not to disclose their gender. The participants’ average age was 27 years ($SD = 7.6$). Again, all participants had an academic background, with half of them already having a university degree and the other half currently pursuing one. 23 were Android users and 17 had an iPhone. The average duration of possessing any smartphone was 9.15 years ($SD = 2.56$). Participants used their smartphone daily for an average of 4.37 hours ($SD = 2.45$, $max = 13$, $min = 0.1$) and picked up their smartphones on average 48 times a day ($max = 153$, $min = 3$). For an overview of participants’ demography, please refer to Table 2.

Table 2. We ran the study twice: in 2018/2019 (before the COVID-19 pandemic) and in early 2022 (during the omicron wave of COVID-19). The table presents the distribution of participants and letters in the two parts of the study.

	Demographics	Letters
Before COVID-19 $N = 42$	Gender: 9 m, 32 f, 1 n.a.	Type: 22 love, 6 breakup, 8 mixed, 6 neither
	Age: $M = 28$, $min = 19$, $max = 56$	Word-count: $\bar{x} = 114.5$, $min = 14$, $max = 644$
During COVID-19 $N = 40$	Gender: 13 m, 25 f, 2 non-binary	Type: 7 love, 5 breakup, 16 mixed, 8 neither, 4 other
	Age: $M = 27$, $min = 18$, $max = 55$	Word-count: $\bar{x} = 194$, $min = 63$, $max = 475$

5 EVALUATION METHODS

5.1 Automated Sentiment Analysis

We used the Google Cloud Natural Language API¹ for an automated sentiment analysis of the collected letters to partially answer RQ1. The analysis delivers a sentiment *score* and sentiment *magnitude* for the letter *and* for each sentence within the letter. The sentiment score (-1.0 to 1.0) indicates whether the overall *emotional tone* of the analyzed text is negative or positive. The magnitude value indicates *how much* emotional content is present within the analyzed text, ranging from 0 (low) to ∞ (high). A text with a neutral score (around 0.0) may indicate either low or mixed emotions (i.e., where both high positive and negative values cancel each other out). In these cases, the magnitude value is decisive: truly neutral texts will have low values for both magnitude and score, whereas mixed texts will have higher magnitude values in combination with a relatively low score.

The sentiment analysis delivers numeric values only. To interpret the data, Google² recommends researchers to define the threshold for the sentiment and magnitude after careful inspection of their data. We thus set the sentiment threshold for mixed letters between -0.15 and 0.15 – a different threshold did not change the results on observed tendencies in the data. Similarly, we set the magnitude threshold to 4. As such, letters which have a score of, e.g., 0.1 and a magnitude of, e.g., 2 were labeled as neutral in our data set. On the opposite, letters with a score of, e.g., -0.1 and a magnitude of 6 were labeled as mixed sentiment letters.

5.2 Closed Coding Process

In addition, RQ1 aims to explore a more nuanced relation between smartphone features and the induced emotions and caused consequences in everyday life. We thus proceeded by manually coding the letters.

We first split the letters into $N = 819$ individual statements, e.g., “*I love you, because I always watch cute dog videos before I go to sleep. It helps me to get a good sleep.*” (BC6). In this example, two sentences produce one statement as they present a cause-and-effect relationship of one smartphone feature (media consumption). The amount of sentences analyzed automatically with the sentiment analysis and the amount of manually coded statements do not overlap. We grouped several sentences into one statement, if all the grouped (and successive) sentences evolved around the same conveyed message. Similarly, if the statement evolved around more than one emotion or smartphone feature/functionality, we split the sentence in several statements. This process was performed by two coders independently for all 82 letters.

We proceeded by manually coding the statements according to the following four categories (see Section 3.3 for a detailed description of the terms): (1) OCC emotion, e.g. *love*, (2) feature, e.g., *multimedia apps*, (3) consequence, e.g., *better well-being*, and (4) role, e.g., *assistant*. For the categories feature, consequence and role, we applied a bottom-up, open-coding process. However, we still consider this evaluation step as closed coding, as the revised OCC model of emotions determined a certain structure of data analysis. The first and second author coded the whole data set of the letters and discussed any existing doubt in parallel. We did not calculate an inter-rater reliability for the coding, following the advice in [3] that this calculation is rarely used for semi-structured data.

5.3 Open Thematic Analysis

To answer RQ2 and RQ3, we thematically analyzed the extracted statements to determine usage patterns and identify users' strategies to manage the relationship with their smartphones. We applied the same evaluation method for the two open-ended text questions in the DC set of letters asking about the influence of the COVID-19 pandemic on users' relationships to their smartphones. The second author identified the themes for these two questions and discussed them with the first author until an agreement was reached.

¹<https://cloud.google.com/natural-language/docs/analyzing-sentiment>, last accessed 2022-11-08

²https://cloud.google.com/natural-language/docs/basics#interpreting_sentiment_analysis_values, last accessed 2022-11-15

6 DESCRIPTIVE RESULTS

6.1 Collected Letters

In the first part of the study (BC), we collected a total of 43 letters: 13 paper letters at the in-person event and 30 in the online survey. We excluded one letter from the online survey since both coders agreed that the letter's linguistic expression was indecipherable. This resulted in a set of $N = 42$ letters BC. The first letter pool consists of 52% love letters, 14% breakup letters, 19% mixture, and 14% neither, according to our participants' opinion.

In the second part of the study (DC), we gathered $N = 40$ letters in an online survey. We identified a shift in the participants' overall impression of their letter, as there was a decrease in the number of perceived love letters (18%). In fact, most of the letters (40%) were rated as a mixture of love and breakup letter and 20% of the letters were perceived as neither love nor breakup letter. Five letters (13%) were breakup letters, whereas the remaining four (10%) were given an individual description, e.g., an acceptance or neutral letter. The DC-letters were longer with a median of $\tilde{x} = 194$ words – 80 words more compared to the BC-letters ($\tilde{x} = 114$). In the DC study run, participants took 676 seconds on average ($stdev = 421, 8s$, $min = 111s$, $max = 2130s$) to write the letter.³

6.2 Sentiment Analysis Results

The letters' sentiment score was 0.16 on average ($SD = 0.34$), indicating a slight positive trend. A score range between $min = -0.8$ and $max = 0.9$ shows an almost complete coverage of the sentiment scale. The average magnitude of 6.85 ($SD = 3.63$, $max = 15.8$, $min = 0.8$) depicts highly emotional content, which in turn validates our choice of methodology seeking for emotions. The analysis identified $N = 1345$ sentences including 788 positive sentences (226 BC, 232 DC), 330 negative sentences (135 BC, 195 DC) and 227 neutral ones.

Moreover, a large number of "mixed letters" containing both positive and negative sentiments were detected (see Figure 2). The sentiment analysis confirmed the trend emerging from the participants' self-reported assessment of their letters' sentiment (see Section 6.1), with the exception of neutral letters (score < 0.15 and > -0.15, $magnitude \leq abs(score)$). The sentiment analysis indicates that the number of mixed letters increased during COVID-19 as shown in Figure 2 and Table 3.

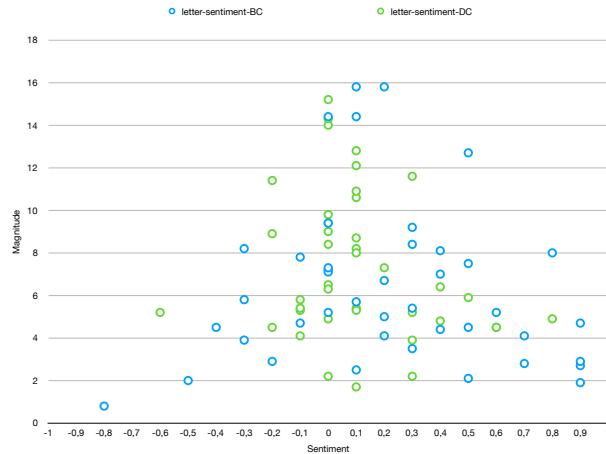


Fig. 2. Results of the automated sentiment analysis for the 82 letters. Every dot presents one letter.

³The duration of writing a letter in the BC run was not recorded.

Table 3. Results of the automated sentiment analysis

Sentiment	Score	Magnitude	# BC	# DC	Total
Clearly Positive	> 0.15	n.a.	23	11	34
Clearly Negative	< -0.15	n.a.	7	4	11
Mixed	$\geq -0.15 \text{ and } \leq 0.15$	> 4	11	23	34
Neutral	$\geq -0.15 \text{ and } \leq 0.15$	≤ 4	1	2	3

6.3 Closed Coding Results

To answer RQ1, we performed a thematic analysis of the letters according to the process described in Section 5.2. We set to determine what *emotions* are being induced by which smartphone *features* and the related *consequences* of their use in the user's everyday life. We used the revised OCC model of emotions (see Section 3) for emotion coding and applied a bottom-up coding process to identify related features and consequences. This process resulted in 17 identified categories of smartphone features (see Figure 6) and eight categories of real-life consequences (see Figure 7). To conclude our investigation in terms of the patterns asked for in RQ1, we again iterated over the letters for a second analysis: We clustered common user-smartphone relationship patterns, which emerged along the lines of our initial *emotion – feature – consequence* analysis. A bottom-up coding resulted in eight clusters which we named *smartphone roles*. Within this section, we list the identified features, consequences and roles along with their frequency of occurrence across the letters' statements.

Table 4. The 17 identified features with examples and their frequency of occurrence.

Identified Feature	Examples	Frequ.	Identified Feature	Examples	Frequ.
Whole smartphone		388	Navigation		26
Service	<i>reminders, calendar</i>	50	Apps	<i>dating-, shopping-apps</i>	24
Ubiquity		30	Setting	<i>flight mode, silent mode</i>	3
Hardware design	<i>battery, durability</i>	59	User behavior	<i>smartphone use behavior</i>	29
UX	<i>interface design</i>	22	Social communication	<i>messaging, phone calls</i>	76
Hardware production	<i>selling price</i>	6	Social media		21
Information access	<i>news, internet</i>	38	Data tracking		8
Media production	<i>camera</i>	18	Notifications		5
Media consumption	<i>games, videos</i>	24			

6.3.1 Identified Smartphone Features. A bottom-up coding of the users' statements regarding the smartphone features and user behavior resulted in 17 features (see Table 4) extracted from 812 statements. We excluded seven of the 819 statements since they are not related to any smartphone functionality or user behavior, but rather reflect on the methodology of writing a letter to one's smartphone (6) or the COVID-19 pandemic (1).

The identified features are not mutually exclusive and represent different levels of abstraction, e.g., *navigation* or *social media* can be accessed through *apps*. Similarly, *media consumption* can facilitate *information access*. We did not aim to find mutually exclusive themes, as smartphone use is characterized by a complex interplay of different functions. Rather, we wanted to identify the features and feature categories that were specifically addressed by users in their statements. While interdependencies cannot be ruled out, this allows us to better elaborate the user perspective on specific features and to preserve the weighting of certain aspects.

The distribution of identified smartphone features in relation to the respective OCC emotions is shown in Figure 3. Roughly half of the statements refer to the whole smartphone. This might be due to the wording of the task, asking participants to address the smartphone in the letters. In some statements, a lower level feature might

have been implicitly contained. However, in the coding process, we closely followed the participants' statements, i.e., we assigned more concrete features only if they were explicitly addressed by users. The tendency of positive and negative OCC emotions in *the whole smartphone* subset is slightly positive (201 positive versus 167 negative), reflecting our previous findings of a complex, yet optimistic relationship within this subset. The rest of the positive statements concentrates on the features of *social communication, services* (i.e., tools and organization services), *information access* and *media consumption and production*. This shows that users utilize and value the variety of functionalities the smartphone offers beyond its primary function of communication – yet, exactly this primary function is recognized as the biggest benefit looking holistically at the smartphone. Nonetheless, 19 statements criticized the *social communication* feature, scattered over different negative emotions. Moreover, *user behavior* was the second most frequently mentioned negative feature after *whole smartphone*. Although smartphone use behavior is not a feature nor functionality of the smartphone itself, we decided to include it in our observations based on its frequent occurrence in the statements. Participants either criticized their own use behavior or the behavior of others. The positive emotions around user behavior are pride or hope – for either being able to resist smartphone use or for hoping to do so in the future. The *social media* feature is also represented rather negatively. Users criticized social media for being a waste of time or fueling disconnection in the real world. Furthermore, the statements revealed *hardware production* for ethical and financial concerns and *notifications* due to interruptions as negative smartphone features. Finally, mixed features in our data set are *hardware design* (32 positive versus 27 negative), *UX* (12 positive versus 10 negative) and *ubiquity* (18 positive versus 13 negative). Some participants praised their smartphone's good design and usability, while others criticized its short life-span. A lack of usability and maintenance effort also caused negative reactions. The ubiquity of smartphones was perceived as both a blessing and a curse: While the smartphone can be a useful everyday tool, it can also put pressure on users to be constantly available or feel less empowered without it.

	positive	pleased	hope	joy	satisfaction	relief	gloating	approving	pride	admiration	gratification	gratitude	liking	love	interest	negative	displeased	fear	distress	fears-confirmed	disappointment	resentment	pity	disapproving	shame	reproach	remorse	anger	disliking	hate	disgust	neutral	SUM (total)	SUM (pos.)	SUM (neg.)
whole smartphone	20	3	30	13	3	6	4	13	3	1	6	50	8	45	2	15	6	16	21	1	8	1	14	9	16	4	22	22	4	10	1	11	388	207	170
ubiquity	4	1										4	2	6			1	1	2					1	1	3	3		1	1	32	18	13		
UX			2									2	1	7						1	1	1	1	1						22	12	10			
hardware design	1	4	1	1		1	1	1					2	19	1	2	3	3		2				1		2	11	3		59	32	27			
hardware production															1									1	2	1		1	6	0	5				
settings	1		1									1																	3	3	0				
apps	1						2					9	1	7										1	1	2	1			25	20	5			
service	1						1					15	4	20										1	1	2	1		3	50	41	6			
navigation	1	1					5					11	3			2			1				1	2					26	21	5				
information access	5	1	1				5					10	1	10				3						1		1			38	33	5				
media production			1	1			3	1				5	3				1				1			1	1	1	1	1	19	14	4				
media consumption	1		2	1			2	1				10	2	3				2				1						25	22	3					
social communication	2	1	1			1	3	1		2	37	4	7			1	3	1	1				2	2	7	2			78	59	19				
social media			1				1		1		1	2				1		4	2				2	2	2	2			21	6	15				
tracking																						2		1	1	2			9	1	8				
notifications																						2	1		1	1			5	0	5				
user behaviour																												2	29	5	22				
SUM	33	11	41	19	4	6	6	37	11	1	9	154	26	132	4	19	13	26	35	3	14	1	16	16	32	17	38	43	25	23	1	19	835	494	322

Fig. 3. Distribution of identified features aggregated across emotions.

6.3.2 Identified Real-Life Consequences. We found 461 of the 812 statements to be associated with a real-life consequence. Most of these consequences are linked to OCC emotions referring to a *consequence of an event*, e.g., "When I'm lost in a foreign city, you help me." (BC33) – OCC emotion: *gratitude*; feature: *navigation*; consequence: *easier life*. However, they also include consequences that are implemented by the user, e.g., "Your bleeping and ringing sounds distract me too much from my life and work, this is why you are always on silent mode." (BC41) – OCC emotion: *hate*; feature: *service*; consequence: *controlled usage*.

We identified 26 categories of real-life consequences and clustered them into eight themes, which are depicted in [Figure 4](#). The clustering of codes into themes was performed with a focus on preserving the different patterns in the *emotion – feature – consequence* link. Similar to the feature-clustering, the themes imply different levels of abstraction caused by the more or less specific content of the user statements. We grouped aspects with a similar outcome (e.g., criticizing a *loss of agency* usually implies a *wish for agency*). For contrasting categories, e.g., *social connection* versus *social disconnection*, we sought to form higher-level categories unless this resulted in a loss of detail. Since *better/worse quality of life* turned out to be two of the most common and multifaceted consequences, we agreed to keep their separation into two themes. [Figure 4](#) shows the distribution of positive, negative and neutral statements across the identified smartphone consequences.

CONSEQUENCE CATEGORY	SUM (aggr.)	CONSEQUENCE	SUM (total)	SUM (pos.)	SUM (neg.)	SUM (neutral)
agency	7	agency	1	1	0	0
		loss of agency	5	0	5	0
		wish for agency	1	0	1	0
relationship with smartphone	107	addiction	22	0	22	0
		dependency	27	1	26	0
		attachment	54	52	0	2
		pragmatism	4	0	3	1
better quality of life	104	easier life	55	54	0	1
		better well-being	18	18	0	0
		escape	30	30	0	0
		empowerment	1	1	0	0
worse quality of life	71	disrupted daily life	24	0	24	0
		disconnection from the rw	9	0	9	0
		lower well-being	22	0	22	0
		loss of skills	16	0	16	0
considerations: ethical, financial, privacy	23	costs	7	2	5	0
		ethical considerations	9	5	4	0
		mistrust	7	0	7	0
social relationships	72	social connection	44	44	0	0
		social disconnection	19	1	17	1
		social pressure	9	0	9	0
coping strategies	62	disuse	30	9	21	0
		reduced usage (break)	24	17	7	0
		controlled usage	8	4	4	0
non-use	15	FOMO	7	0	7	0
		JOMO	8	8	0	0
SUM	461		461	247	209	5
%	100		100	53.58	45.34	1.08

Fig. 4. Consequences aggregated across emotions – green: positive consequences, red: negative, yellow: mixed.

The majority of the statements containing a consequence described a change in the user's quality of life as consequence, which could either get better ($n = 104$) or worse ($n = 71$). Users mostly mentioned an easier, more organized life thanks to the smartphone taking over simple tasks such as reminding the user or waking them up in the morning. The *better* or *worse well-being* consequences align with previous findings on the mutual influence of users' emotions on smartphone use [62]: In the state of lower well-being, users turn to their smartphone for an escape, whereas extensive or meaningless smartphone use can at times deteriorate their well-being.

Roughly a quarter of the statements addresses the users developing a certain relationship to their smartphones. While *attachment* has exclusively positive connotations, *dependency* and, more extremely, *addiction* describe the negative side of the spectrum. This indicates that users might want to bond with their smartphones, but still want to preserve a sense of agency over their smartphone use (*agency* consequence). A small number of participants adopted a pragmatic attitude towards their smartphone. In our sample, this type of relationship was associated with negative emotions. Another frequently identified positive consequence is *social connection* ($n = 44$), whereas *social disconnection* represents the opposite ($n = 17$). On the one hand, social communication features facilitate connecting to people who are at different places, but on the other hand, the smartphone hinders face-to-face communication in the physical world. This finding is closely related to the *disrupted daily life* consequence ($n = 24$). Constant interruptions, both externally (e.g., notifications) [29] and internally (e.g., rooted habits) [50, 58] may result in a disrupted everyday life. Accordingly, some participants stated to restrict their smartphone use depending on context (*non-use* consequence) and almost equally experienced either fear-of-missing-out (FOMO) [69] or joy-of-missing-out (JOMO) [2]. A total of 23 statements included ethical, financial or privacy concerns regarding smartphones. These consequences were entirely perceived as the fault of someone else (e.g., the manufacturer). Regarding the users' own behavior, 13% of the statements ($n = 61$) described participants' ways of managing their smartphone use, which we discuss in more depth in section 8.

7 SMARTPHONE'S ROLES: USER-SMARTPHONE RELATIONSHIP PATTERNS [RQ1]

To answer RQ1, i.e., to identify common patterns characterizing the user-smartphone relationship, we ran a second analysis over our data set. This time, we put the emotions with the identified features and consequences into *emotion – feature (-consequence)* links.

Depending on whether there is a real-world consequence in the statement, the link can be read as follows:

without consequence: The user feels {emotion} for {feature}.

with consequence: The user feels {emotion} for {feature} because {consequence}.

We then proceeded with a bottom-up, open-coding of the links looking for patterns in the data. The emerging patterns can be described as *roles* the smartphone can incorporate in the user's everyday life. Previous work has identified the smartphone as a virtual friend [17]: Similar to a person having different types of friends – a childhood friend, the long-night-hours friend or a toxic friend – the smartphone can impersonate different types of friends depending on their everyday contexts, life stages or use behaviors.

We initially identified approximately 20 roles which we clustered into eight final smartphone role categories: *assistant*, *companion*, *entertainer*, *hinderer*, *nuisance*, *object*, *obsession* and *villain*. The distribution of roles across emotion types can be seen in Figure 5. In addition, Table 5 presents the entire letter BC20 as a particularly well-worded example of a letter that contains most roles and managing strategies the we identified in Section 8.

The roles are not mutually exclusive as, e.g., relying too much on the smartphone as one's *assistant* (i.e., a *negative assistant*) can turn the smartphone into a *hinderer* that inhibits the acquisition of new skills. In the following, we elaborate on each smartphone role by connecting the roles to their common *emotion – feature (-consequence)* links, accompanied by participants' statements where applicable. A list of tables containing common links and their frequencies for each role can be found in Appendix A.2.

Table 5. Letter BC20 presenting a well-worded example including different roles and coping strategies to manage smartphone use.

Dear smartphone,

First the [positives]: I like how you are there for me nearly anytime and how you enable the close contact with friends and family in like every conceivable situation. → companion

Further: it is great that you show me the way when I am at a new place and you tell me which train to take and where to change, to not waste time and take the fast tracks within Munich or Berlin or tell me where the traffic takes place right now so that I know where to go by car for example. You helped me several times in hard life situations, especially, when friends live in other cities far away and I need to talk to them and to text, even when I am on the go or in university, because I was so unstable. You help me to remember things, you are my alarm-clock, notebook, camera, flashlight, audio-player, sometimes I even watch Netflix on you while I travel and meanwhile you are just so small and with so little weight. → assistant

Actually you are a beautiful machine with a great name and not an iPhone that everybody has. You look wonderful without any plastic and you fit just so well right into my small hands. → valuable object

But don't be angry with me [for] not using you within the last weeks. I mean I have you with me just in case, [if] I need to make an emergency call and to reach my mom while I am on a walk with my dog, but I feel much pressure through you when I am on vacation at my Mom's. There I don't want everybody to reach me anytime and I begin to have doubts about the craziness that we call our daily life. → strategy: reduced use

I mean, I don't want to rely just on you and I want to turn you off without everybody jelling at me, desperately trying to reach me hundreds of times. I even don't want to put so much time into watching photos from others, of things that I don't see and a life that I don't live. I don't want e-Mails to be the first thing I see, before I even got up and I don't want to be with people who look at their displays 60% of the time we spend together. → villain: oppressor

I want my life back and I am sorry, because you helped me so much to be here today, but I need to have my old Canon in my hands and to decide which photo is it worth to take it and which people are worth to talk to. → hinderer

By the way, the tracking thing that's going on with you... not cool. I love you, you know that, but that's paranoid. → villain: traitor

Another thing I don't like about you is the way you were made and the way you are going to end after not being able to serve me any more. I don't need people to suffer, just because I am so convenient and can't take a citymap with me. Think about it. → replaceable object

Well there are two options for the future: One, I learn to use you for me as I need you and probably that is just in business-things, or two, I let it be and just have like a normal emergency phone with me and that's it. → strategy: controlled use

And you know what I think: Longterm, I [will] need you less and less and in the end I [will be able to] live [a] better life without you. → strategy: disuse

Thank you for everything and be there for my kids in their youth, when they'll maybe need you and maybe they are so happy with a life without pressure, that is slower and full of joy, that they may die the way I did.

*Love,
Your secret admirer*

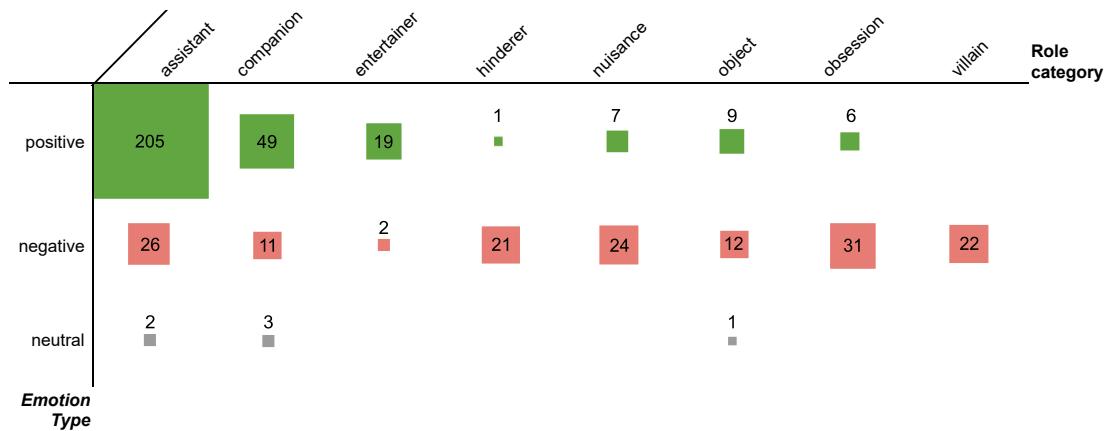


Fig. 5. Distribution of positive, negative and neutral statements across the identified smartphone roles.

7.1 Assistant

The most strongly represented role was *assistant*. Not only did we find this role to be the most common in the emotion – feature – consequence link, but it was also the role associated with the greatest number of positive statements. The three most frequent positive emotions associated with the smartphone as an assistant are *gratitude*, *love* and *approval* (see Table 6). The listed feelings most often occur for the smartphone facilitating communication to friends and family. In turn, this causes social connection in the digital world and a higher level of well-being in the physical world.

“I’m so grateful to you of how you are able to link me [so I am able to communicate] through such an easy and comprehensive way that it nearly feels I’m still with [my family and other beloved ones] in my hometown.” (DC3)

Users express gratitude because the smartphone provides *services* that help users complete everyday tasks, such as waking up, taking notes, or remembering todos. These services, along with *navigation* support (in unfamiliar places), make users’ lives perceivably easier. From some statements, it appears that users learn a new skill by using the listed services, which in turn empowers them.

“I communicate better with you. I have more friends with you. To people not skillful in communicating or face-to-face talking you’ve been a great help. You help us raise our self-confidence.” (BC19)

Gratitude is furthermore indicated for the smartphone’s assistance in accessing information, i. e., the smartphone is the user’s “window to the outside world” or “a portal to another world”. The use of media production services such as the camera also preserves memories and embodies the smartphone as a kind of keeper.

“You are my eye to the outside world, I read news through you and gather pictures and ideas that inspire me.” (BC22)

In the less common negative statements around the role *assistant* (see Table 6), delegating tasks to the smartphone caused remorse and shame in some participants. They felt being dependent on the smartphone, which lead them to perceive a loss of certain skills.

“I was negatively surprised when I realized I could not find my way back to my hotel in a new place without you. Before you came, people would look at the paper-printed tourist maps and find their way, but now your maps have made it so easy to trace where we are, that going to a new place is not a hassle anymore.” (DC6)

Opposed to the positive statements on social connection, some statements revealed gloating, shame or disappointment about social connection in the digital world causing social isolation in the real world.

"It seems that even though you have connected the world you have made each person live on their own Islands." (DC1)

7.2 Companion

In the *companion* role, the most prominent consequence is users' feeling of attachment to their smartphone (see [Table 8](#)). Users feel gratitude, love and joy for this bond. The smartphone is perceived as someone the user can turn to (*attachment consequence*) at any time and any place (*ubiquity feature*). In rare extreme cases, the smartphone is perceived as an extension of user's own self.

"You are a very important part of my life , you never leave me alone, always there whenever I need you." (BC23)

However, ubiquity can sometimes transform the positive attachment into a more stressful and anxious form of dependency, where users experience a loss of independence or suffer from the social pressure to be available for everyone at any time.

"You are there 24/7, sometimes I wish you would go on a little vacation and give me some space, to not give me the feeling of letting someone down if I don't text back or react to this picture or that post." (DC21)

7.3 Entertainer

The role of *entertainer* primarily triggers feelings of gratitude and liking towards the smartphone and its media consumption functions (see [Table 9](#)), e.g., listening to music or watching videos. The smartphone thereby offers an escape from reality or induces a higher sense of well-being in situations where users feel uncomfortable or bored.

"I love you, because I always watch cute dog videos before I go to sleep. It helps me to get a good sleep." (BC7)

A few statements also showed that the smartphone as an entertainer may draw the user into a rabbit hole, disrupting daily life, which in turn can make the user feel angry (see [Table 9](#)).

"You suggest me all the nice apps and games, so I am spending a lot of time, pointless [h]ours, just to be entertained." (DC19)

7.4 Hinderer

The hinderer role is an exclusively negative one (see [Table 10](#)). The user-smartphone relationship is characterized with emotions such as anger, remorse or disapproving the smartphone's actions. As a predominant consequence, user's have a lower sense of well-being. As a hinderer, the smartphone "*absorbs*" the user and thus repeatedly keeps them from completing real-world tasks, impairing their performance (*consequence disrupted daily life*) or social relationships (*consequences social disconnection and disconnection from the real world*) in the long run.

The surrounding physical world is an important factor in this role. The statements show that real-world activities are hindered by the smartphone (e.g., working, studying, playing a musical instrument). Some users felt remorse about abandoning other activities in favor of the smartphone, wishing for (suggestions for) alternative activities instead.

"[S]ometimes smartphone, I miss the old me, before I met you. I was better at math. I spent my free time engaged in wonderfully creative pursuits". (BC18)

7.5 Nuisance

The variety of negative links in [Table 11](#) indicates that the role *nuisance* is characterized by many problems in different contexts evolving around interruptions, such as notification sounds or personal habits. These disrupt the user's current activities in the real world. Related negative emotions are *anger*, *grief*, *shame* or *disappointment* (see [Table 11](#)) for not being in control or in the moment.

"Now, I heard your "ping". I instantly want to know what's going on, what do you want to tell me? There are always some notifications, but to be honest, most of them are not really important or even slightly interesting." (DC37)

Some participants' statements reveal a more severe and nature of these interruptions, reporting about disturbing sleep or distracting while driving – both situations where rest and attention is essential for well-being and safety.

"Another sleepless night has passed. Insomnia has kept me awake, pondering about things you showed me the night before." (DC22)

Two participants stated experiencing a “joy-of-missing-out” (JOMO) (*relief* in the OCC model) after separating from their smartphone. In this case, the smartphone is recognized as a nuisance only after separation.

"When I'm in the mountains without mobile reception I appreciate the quiet and don't feel the urge of looking at you." (DC8)

Yet, several participants welcomed this distracting nature of their smartphone and saw comfort in the nuisance, helping them to escape from reality.

"I kinda need this "escape" into your apps. The pandemic isn't over yet and we're all experiencing collective trauma as we continue to function. With you, I feel like I don't have to think. Thinking about what is happening and what might happen. Existential fears, depressions[, etc.]. I can "pause" very briefly with you. (DC12)"

7.6 Object

Based on the hardware design feature (see [Table 12](#)), we identified the role of an *object* in which the smartphone is seen as a “thing”. When it is perceived negatively, it is declared as “*only an object*”, whereas in the positive case, it is considered as an object of value. Users love the smartphone for its hardware design, for its sentimental value or for being a luxury object.

"Your system has no delay and it [can] quickly compute [...] everything! The design is beautiful and the [screen] size is [perfectly] suitable for my hands. I really love your system iOS, it's fluent and easy to use." (BC12)

Yet, some participants report disliking the hardware manufacturing process and express ethical or financial concerns.

"Sometimes iPhones in other colours catch my attention and I think about replacing you, but then I think of sustainability and that looks are not as important as inner values." (DC32)

When seen as “*just a thing*”, users feel pity for the smartphone as they find it easily replaceable.

"As I risk that you become overconfident and arrogant [for being a perfect substitute to an organizer], I also want you to know [that] the day you stop working I'll just get a new smartphone... [At the end, you seem to be redundant without mankind.]" (DC29)

7.7 Obsession

In the *obsession* role, the smartphone embodies something that users cannot detach themselves from in their everyday lives. This does not primarily affect a particular smartphone function, but rather the user's own

smartphone use behavior. We identified remorse and shame as the predominant negative emotions, as depicted in [Table 13](#). Statements for this role frequently evolve around *addiction*, *high need*, and *shame*.

"When I sit there and waste my time and I see that two hours have passed, I think to myself 'why can't I let go?'" (DC5)

Many users want to restrict their smartphone use, but somehow fail to do so. At times, they compare the smartphone to addictive substances, as if they are trying to blame the smartphone and not themselves.

"You are triggering an addiction, and I am a vulnerable patient, it's like you are chocolate." (DC19)

7.8 Villain

In the exclusively negative role *villain*, users perceive the smartphone as intentionally working against their benefit. In contrast to the obsession role, users blame the smartphone rather than themselves for their negative use behavior. We identified two subgroups within this role. First, when seen as an *oppressor*, the user accuses the smartphone of persuading them to perform actions against their will. Users therefore express *anger*, *hatred*, and *disapproving*, which can result in a loss of agency, disrupted daily life, and decreased well-being (see [Table 14](#)).

"You definitely know, that I love to be distracted and that I love to flee from the reality, my problems and my to-do list. And I have to say - I really hate that. I hate what you are doing to me." (DC19)

In the second subgroup, the user disapproves the tracking of personal data and potentially selling it to third parties, causing *mistrust* and seeing the smartphone as a *traitor*. However, in some statements, although acknowledging the mistrust issue, users are fascinated by it or continue loving their smartphone in spite of it.

"So to me you are a very helpful spy. [...] I guess I do love you, but I do not trust you!" (DC11)

8 USERS' STRATEGIES TO MANAGE RELATIONSHIP WITH SMARTPHONE [RQ2]

To answer RQ2, we explain the strategies users implement to manage the relationship with their smartphones.

In 45% of the letters ($n = 32$), participants describe how they currently manage their smartphone usage or express their wish to change it. The statements can be clustered in three different user strategies: (1) *disuse*, (2) *reduced use*, and (3) *controlled use* (see [Figure 7](#), "Coping Strategies"). *Hope* is the most commonly associated emotion with these three consequences. This indicates, that people contemplate about their relationship and are positive about a change to the better.

8.1 Disuse

In 30 statements, people express their wish for a "breakup" with certain smartphone features or their whole smartphone. The most commonly associated emotions are *hope* ($n = 5$), e.g., *"I think it is time we go our separate ways. Explore new options."* (BC21), *disliking* ($n = 4$), e.g., *"I tossed your predecessor, whose battery was always flat, into the bin and got a new phone – you – instead."* (BC41), and *pity* ($n = 4$), e.g., *"I am so very sorry to say, but I think you and me will not work any longer together!"* (BC25).

8.2 Reduced Use

In 24 statements, users say that they need a break with their smartphone, leading to the consequence "reduced use". In contrast to the consequence "disuse", reduced use is restricted to certain situations or time frames. Some participants describe concrete strategies how they manage these breaks, e.g., *"I think our relationship got better since I banned you from the bedroom and send you to sleep (aka flight mode)."* (DC18). Another participant replaced smartphone use with "real-world" activities: *"I cheated yesterday with a really good book and you know what? I liked it."* (DC19). For reduced use, the most prominent emotion is *hope* ($n = 7$), e.g., *"How about we take a break? Just to see how I cope when my vision is more focused on my surroundings and I have no plugs in my ears?"* (BC22).

8.3 Controlled Use

Eight participants (plan to) employ strategies to manage their smartphone use behavior. These include, for example, screen time apps, e.g., “*If it turns out I can cope well, I'll set a time limit on you.*” (BC22), silent mode, e.g., “*Your bleeping and ringing sounds distract me too much from my life and work, this is why you are always on silent mode.*” (BC41), or conscious use, e.g., “*I should probably stop being so clingy and think more about when and why I spend time with you.*” (DC32). Again, *hope* is the predominant emotion for the consequence category “controlled use” ($n = 4$).

9 BEFORE AND DURING COVID-19 [RQ3]

We compared the distribution of positive, negative and neutral statements among the identified smartphone features from the letters that we collected before and during the COVID-19 pandemic. The overall results are in line with the Sentiment Analysis (see section 6.2). Before the pandemic, 65% of the statements were positive, whereas this value decreased to 55% for the letters collected during the pandemic. Negative statements increased from 34% to 41%.

Split by feature, we observed these changes (values $\leq 1\%$ excluded):

- (1) more negative statements: whole smartphone (+5%), user behavior (+3%)
- (2) less positive statements: apps (-3%), services (-2%), social communication (-5%)
- (3) less statements: hardware design (positive -2%, negative -5%)
- (4) more positive statements: information access (+2%)

These trends indicate a slight shift of focus from individual smartphone features (hardware and software) to a more holistic view on the user-smartphone relationship. Our sample of participants recruited during the pandemic engaged more in critical reflection on their smartphone use behavior. A potential reason for the decrease of positive statements on social communication could be the consequence “social disconnection”: During the pandemic, people had to rely on virtual communication **only**. While they were grateful for the opportunity to stay in touch via their smartphones, the negative feeling of being forced to switch to virtual communication might have prevailed. Although this is not directly the smartphone’s “fault”, it can still lead to negatively affected user perceptions. In addition, accessing the news and staying connected to “the outside world” became more important, which may explain the increase of positive statements on the feature “information access”.

In the second part of the survey (during COVID-19), we asked participants to describe (1) how the pandemic influenced their relationship with their smartphone and (2) how their smartphone use influenced their everyday real-life. Two researchers performed a Thematic Analysis of the answers to the open questions, yielding the following results. Themes occurring only once are excluded from the results.

User-Smartphone Relationship. 20 of the 40 participants stated to use their smartphone *more* than before the pandemic, seven stated to use it the *same* and only four said they used their smartphone *less*. Three participants claimed to feel *closer* to their smartphone. The two most commonly mentioned reasons for increased use are *virtual communication* (18) due to restricted personal contacts and using the smartphone as an *escape from reality* (6). Moreover, people used their phones more frequently to check the *news* (3) and to use *contact tracing apps* including digital vaccination certificates (3). Two participants were concerned about *smartphone overuse*.

Influence on Real-Life. 14 of the 40 participants stated that their smartphone use did *not* noticeably influence their everyday real-life during the pandemic. On the other hand, people used their phones more to *stay in touch with friends* (8), e.g., through *calls* (3). Two people stated that their smartphone served as a *bridge between the real and the virtual world*. Some participants mentioned that they used their smartphone as an *escape* (4), filling *empty time slots* (2). People increasingly used their smartphone to *read the news* (3) or for *contact tracing* (2). Three participants perceived their smartphone as a *hinderer*, promoting procrastination options.

10 LIMITATIONS AND FUTURE WORK

The letters were collected in a technologically advanced country with all participants having an academic background. Since this user group belongs to the social (upper) middle class, a sophisticated smartphone is easily affordable and part of everyone's daily life. The results therefore only account for this specific, yet common, user group. It would be interesting to replicate this study for an ethnological group, in which smartphones supposedly play a different role, e.g., refugees. Moreover, the letters collected during the COVID-19 pandemic were gathered from a different user-set than before the pandemic. Therefore, we cannot draw direct within-subject comparisons, but rather cautiously interpret the differences in a wider context.

We performed the thematic analysis by extracting and analyzing the statements from the letters manually. We realize that this is a very expensive process and difficult to replicate – a different way of grouping the statements might have revealed other features, consequences and roles. To validate our analysis on the letters' level, we used Google's Natural Language API, an off-the-shelf solution. We informed this choice with related work which followed a similar approach (e.g., [16]). However, an upfront comparison of several off-the-shelf solutions on common data-sets might have resulted in another option. Although we do not claim a methodology contribution, our extensively labeled data set along the existing OCC model of emotions allows us to envision the development of a (semi-)automated labeling algorithm as future work to analyze other digital products and services.

11 THE TALE OF A COMPLICATED RELATIONSHIP: DISCUSSION & DESIGN IMPLICATIONS

Positive Situation. In general, our participants stated to have written more love (i.e., positive) than break-up (i.e., negative) letters, a finding confirmed by both the automated sentiment analysis and our coding. A more fine-grained inspection on sentence- and statement-level also showed more positive than negative statements – yet, their number shrunk within the letter pool written during COVID-19 by approximately 10% (65%+ and 35%– before COVID-19 versus 55%+ and 45%– during COVID-19).

We found a tendency towards positive patterns of use mainly in the roles *assistant*, *companion* and *entertainer*. There, we identified a high number of statements beginning with “*you help me with*” or “*thank you for*”, that express a high degree of users' gratitude towards their smartphone. Similarly, many users expressed love for their smartphone within these roles for, e.g., making their life easier by taking over tasks or teaching new skills, being a faithful companion they are attached to, or for entertaining them in moments of boredom. As the presented quotes show, we were able to identify a large set of literary expressions that go beyond the currently prevalent negative storyline around smartphones, moving away from an addictive perspective. As such, we contribute to more recent body of work in HCI aiming to contribute to a positive storyline of smartphone use [18, 35].

Along the same roles, we identified a relationship shaped by positive *attachment* (aligning with, e.g., [34, 46]) as the most prominent one – a relationship, in which the smartphone feels like a friend the user can rely on, but from whom they can distance themselves if desired, keeping a sense of autonomy [39] over their smartphone use. This comes as no surprise, given the basic human need of belonging to someone or something. In turn, the consequence *pragmatism*, linked to the smartphone role *object*, explains users seeing their smartphone as a tool only. Again aligned with previous work, it is not surprising that pure pragmatism was connected with rather negative emotions, such as indifference and pity. Based on our observations, we thus generally recommend researchers and designers to foster a certain level of attachment and companionship, as opposed to viewing the smartphone exclusively as a tool.

Complication. The number of mixed letters we found is equal to the number of love letters, hinting towards a rather complicated relationship for some people. Our detailed qualitative analysis showed that these users weigh the positive and negative smartphone features against each other, resulting in complex cost-benefit considerations. This fortifies our observation that smartphones embody a certain role in users' everyday lives depending on context – that is, one role is rarely exclusively present within one user's letter. According to our findings, the

smartphone slips in different roles based on the users' different contexts, moods and real-life activities. Thereby, the smartphone or its specific features either support or hinder users' task performance. Whereas the supportive nature is present in the roles *assistant*, *companion*, and *entertainer*, the impeding aspects are dominant within the roles *hinderer*, *nuisance*, *obsession*, and *villain*. Moreover, we observe that positive attachment through, e.g., companionship, can easily shift to a more negative form of dependency and, most extremely, obsession (i.e., addiction) – potentially resulting in a loss of skill or compulsive behavior as described by users. This might be due to the smartphone's ubiquitous nature, i.e., availability anywhere and anytime. We underline the findings of recent related work, pointing towards finding a balance between smartphone use and real-world activities [71]. Our participants mentioned, for example, reading a book or playing an instrument. Future work could further explore and formalize a life-mobile-technology balance. The collected letters indicate an individual preference for this balance – some users enjoy their presence in the digital world more than others.

Resolution. The entanglement of roles can cause an inner conflict for users, often accompanied by feelings of remorse and shame, as users prevalently blame themselves for their negative behavior. In other words, they feel in charge for their responsible use. Similar to previous discussions [38], we ask whether it is really user's "fault"? Who is responsible for responsible use – is it the user, or is it the designers of technology?

We found that smartphone users develop strategies to manage their behavior, always implying a certain extent of disuse: either time-wise (i.e., reduce time spent with smartphone), feature-wise (i.e., block the use of certain features) or context-wise (i.e., complete disuse in certain contexts such as vacation). However, due to the positive aspects of smartphones, users tend to come back to their devices and the unwanted features and behaviors return into users' lives. We therefore can and should not design for complete disengagement, as it may lead to a back and forth of unwanted consequences (e.g., FOMO) and guilty conscience. Rather, we envision a future that moves beyond the attention economy and considers users' well-being by designing for a balanced smartphone use. For example, recent work envisions "positive disengagement" [39], with the smartphone teaching the user skills and fading away after succeeding. Another concept is restricting resources: the game "Wordle"⁴ has become highly successful, although users can play the game only once a day. HCI can consult designers and government bodies on developing new interaction paradigms that do not exploit the infinite amount of digital resources, but rather as physical materials which have an expiration date.

12 CONCLUSION

We investigated how different smartphone features and aspects influence users both internally by means of emotions and externally by means of real-world consequences. We gathered 82 love/breakup letters (42 before and 40 during the COVID-19 pandemic) to users' smartphones and performed an extensive, explorative qualitative analysis of 819 statements extracted from the letters. The overall tone of the letters showed a tendency towards positive emotions, with a slight shift towards negative emotions during the COVID-19 pandemic. By connecting users' emotions with the identified smartphone features and real-life consequences, we found eight patterns of use – represented by smartphone roles – describing the user-smartphone relationship: the roles *assistant*, *companion*, and *entertainer* incorporate patterns of use yielding positive emotions, whereas the roles *hinderer*, *nuisance*, *obsession* and *villain* are associated with negative emotions. The role *object* is connected to either positive or negative emotions. Most letters comprised a mix of positive and negative smartphone roles, often including cost-benefit considerations about smartphone features and related user behavior. The "tale of complicated user-smartphone relationship" concludes that the control over responsible smartphone use should not only be in the hand of users, but part of a particularly conscious design process. We suggest a "healthy diet" of smartphone use, with researchers and designers being the "nutritionists" for smartphone users.

⁴<https://www.nytimes.com/games/wordle/index.html>

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REFERENCES

- [1] 2007. Steve Jobs introduces iPhone in 2007. <https://youtu.be/MnrJzXM7a6o>. Retrieved January 27, 2023.
- [2] Julie H Aranda and Safia Baig. 2018. Toward JOMO: the joy of missing out and the freedom of disconnecting. In *Proceedings of the 20th International Conference on Human-Computer Interaction with Mobile Devices and Services*. ACM, 19.
- [3] David Armstrong, Ann Gosling, John Weinman, and Theresa Marteau. 1997. The place of inter-rater reliability in qualitative research: An empirical study. *Sociology* 31, 3 (1997), 597–606.
- [4] Tunc-Aksan Aygul and Sinem Evin Akbay. 2019. Smartphone addiction, fear of missing out, and perceived competence as predictors of social media addiction of adolescents. *European Journal of Educational Research* 8, 2 (2019), 559–566.
- [5] Joël Billieux, Adriano Schimmenti, Yasser Khazaal, Pierre Maurage, and Alexandre Heeren. 2015. Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. *Journal of behavioral addictions* 4, 3 (2015), 119–123.
- [6] Nadine Büchler, Claartje L ter Hoeven, and Ward van Zoonen. 2020. Understanding constant connectivity to work: How and for whom is constant connectivity related to employee well-being? *Information and Organization* 30, 3 (2020), 100302.
- [7] An IDC Research Report Sponsored by Facebook. 2013. Always Connected: How Smartphones And Social Keep Us Engaged. [https://www.nu.nl/files/IDC-Facebook%20Always%20Connected%20\(1\).pdf](https://www.nu.nl/files/IDC-Facebook%20Always%20Connected%20(1).pdf). (Accessed on 05/15/2022).
- [8] Astrid Carolus, Jens F Binder, Ricardo Muench, Catharina Schmidt, Florian Schneider, and Sarah L Buglass. 2019. Smartphones as digital companions: Characterizing the relationship between users and their phones. *New Media & Society* 21, 4 (2019), 914–938.
- [9] Hyunsung Cho, DaEun Choi, Donghwi Kim, Wan Ju Kang, Eun Kyoung Choe, and Sung-Ju Lee. 2021. Reflect, Not Regret: Understanding Regretful Smartphone Use with App Feature-Level Analysis. *Proc. ACM Hum.-Comput. Interact.* 5, CSCW2, Article 456 (oct 2021), 36 pages. <https://doi.org/10.1145/3479600>
- [10] Thomas H. Davenport and John C. Beck. 2001. *The attention economy: Understanding the new currency of business*. Harvard Business Press.
- [11] Meredith E David and James A Roberts. 2017. Phubbed and alone: Phone snubbing, social exclusion, and attachment to social media. *Journal of the Association for Consumer Research* 2, 2 (2017), 155–163.
- [12] Meredith E David and James A Roberts. 2021. Smartphone use during the COVID-19 pandemic: Social versus physical distancing. *International Journal of Environmental Research and Public Health* 18, 3 (2021), 1034.
- [13] Kadir Demirci, Mehmet Akgönül, and Abdullah Akpinar. 2015. Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. *Journal of Behavioral Addictions* 4, 2 (June 2015), 85–92. <https://doi.org/10.1556/2006.4.2015.010>
- [14] Sarah Diefenbach and Kim Borrmann. 2019. The Smartphone as a Pacifier and its Consequences: Young adults' smartphone usage in moments of solitude and correlations to self-reflection. In *Proceedings of the 2019 CHI conference on human factors in computing systems*. 1–14.
- [15] Melanie Duckert and Louise Barkhuus. 2021. To Use or Not to Use: Mediation and Limitation of Digital Screen Technologies within Nuclear Families. In *ACM International Conference on Interactive Media Experiences*. 73–83.
- [16] Malin Eiband, Sarah Theres Völkel, Daniel Buschek, Sophia Cook, and Heinrich Hussmann. 2019. When People and Algorithms Meet: User-Reported Problems in Intelligent Everyday Applications. In *Proceedings of the 24th International Conference on Intelligent User Interfaces* (Marina del Ray, California) (*IUI '19*). Association for Computing Machinery, New York, NY, USA, 96–106. <https://doi.org/10.1145/3301275.3302262>
- [17] Chris Fullwood, Sally Quinn, Linda K Kaye, and Charlotte Redding. 2017. My virtual friend: A qualitative analysis of the attitudes and experiences of Smartphone users: Implications for Smartphone attachment. *Computers in Human Behavior* 75 (2017), 347–355.
- [18] Julie M Funk, Matthew Lakier, Marcel O'Gorman, and Daniel Vogel. 2021. Exploring Smartphone Relationships through Roland Barthes using an Instrumented Pillow Technology Probe. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. 1–13.
- [19] Marlene Gertz, Simone Schütz-Bosbach, and Sarah Diefenbach. 2021. Smartphone and the Self: Experimental Investigation of Self-Incorporation of and Attachment to Smartphones. *Multimodal Technologies and Interaction* 5, 11 (2021), 67.
- [20] Luke Haliburton and Albrecht Schmidt. 2020. Technologies for healthy work. *Interactions* 27, 3 (April 2020), 64–66. <https://doi.org/10.1145/3386391>
- [21] Lydia J Harkin and Daria Kuss. 2021. "My smartphone is an extension of myself": A holistic qualitative exploration of the impact of using a smartphone. *Psychology of Popular Media* 10, 1 (2021), 28.

- [22] Ellie Harmon and Melissa Mazmanian. 2013. Stories of the Smartphone in everyday discourse: conflict, tension & instability. In *Proceedings of the SIGCHI conference on human factors in computing systems*. ACM, 1051–1060.
- [23] Bethany Harris, Timothy Regan, Jordan Schueler, and Sherecce A. Fields. 2020. Problematic Mobile Phone and Smartphone Use Scales: A Systematic Review. *Frontiers in Psychology* 11 (2020). <https://doi.org/10.3389/fpsyg.2020.00672>
- [24] Maxi Heitmayer and Saadi Lahlou. 2021. Why are smartphones disruptive? An empirical study of smartphone use in real-life contexts. *Computers in Human Behavior* 116 (2021), 106637. <https://doi.org/10.1016/j.chb.2020.106637>
- [25] Juan Herrero, Andrea Torres, Pep Vivas, Álvaro E Arenas, and Alberto Urueña. 2021. Examining the empirical links between digital social pressure, personality, psychological distress, social support, users' residential living conditions, and smartphone addiction. *Social Science Computer Review* (2021), 0894439321998357.
- [26] Alexis Hiniker, Shwetak N Patel, Tadayoshi Kohno, and Julie A Kientz. 2016. Why would you do that? predicting the uses and gratifications behind smartphone-usage behaviors. In *Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing*. 634–645.
- [27] Niklas Johannes, Harm Veling, Thijs Verwijmeren, and Moniek Buijzen. 2018. Hard to Resist? *Journal of Media Psychology* (2018).
- [28] Elihu Katz, Jay G Blumler, and Michael Gurevitch. 1973. Uses and gratifications research. *The public opinion quarterly* 37, 4 (1973), 509–523.
- [29] Inyeop Kim, Hwarang Goh, Nematjon Narziev, Youngtae Noh, and Uichin Lee. 2020. Understanding User Contexts and Coping Strategies for Context-Aware Phone Distraction Management System Design. *Proc. ACM Interact. Mob. Wearable Ubiquitous Technol.* 4, 4, Article 134 (Dec. 2020), 33 pages. <https://doi.org/10.1145/3432213>
- [30] Inyeop Kim, Rihun Kim, Heebyung Kim, Duyeon Kim, Kyungsik Han, Paul H Lee, Gloria Mark, and Uichin Lee. 2019. Understanding smartphone usage in college classrooms: A long-term measurement study. *Computers & Education* 141 (2019), 103611.
- [31] Jaejeung Kim, Chiwoo Cho, and Uichin Lee. 2017. Technology supported behavior restriction for mitigating self-interruptions in multi-device environments. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* 1, 3 (2017), 1–21.
- [32] Ksenia Kirillova and Dan Wang. 2016. Smartphone (dis)connectedness and vacation recovery. *Annals of Tourism Research* 61 (2016), 157–169.
- [33] Minsam Ko, Seungwoo Choi, Koji Yatani, and Uichin Lee. 2016. Lock n'LoL: group-based limiting assistance app to mitigate smartphone distractions in group activities. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*. 998–1010.
- [34] Veronika Konok, Dóra Gigler, Boróka Mária Bereczky, and Ádám Miklósi. 2016. Humans' attachment to their mobile phones and its relationship with interpersonal attachment style. *Computers in Human Behavior* 61 (2016), 537–547.
- [35] Simone Lanette, Phoebe K Chua, Gillian Hayes, and Melissa Mazmanian. 2018. How Much is 'Too Much'? The Role of a Smartphone Addiction Narrative in Individuals' Experience of Use. *Proceedings of the ACM on Human-Computer Interaction* 2, CSCW (2018), 101.
- [36] Simone Lanette and Melissa Mazmanian. 2018. The "Smartphone" Addiction" Narrative is Compelling, but Largely Unfounded. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems*. 1–6.
- [37] Li Li and Trisha TC Lin. 2019. Smartphones at work: a qualitative exploration of psychological antecedents and impacts of work-related smartphone dependency. *International Journal of Qualitative Methods* 18 (2019), 1609406918822240.
- [38] Kai Lukoff. 2019. Digital wellbeing is way more than just reducing screen time. <https://uxdesign.cc/digital-wellbeing-more-than-just-reducing-screen-time-46223db9f057>
- [39] Kai Lukoff, Cissy Yu, Julie Kientz, and Alexis Hiniker. 2018. What makes smartphone use meaningful or meaningless? *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* 2, 1 (2018), 1–26.
- [40] B. Martin, B. Hanington, and B.M. Hanington. 2012. *Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions*. Rockport Publishers. <https://books.google.de/books?id=uZ8uzWAcdxEc>
- [41] Jeremy Marty-Dugas, Brandon C. W. Ralph, Jonathan M. Oakman, and Daniel Smilek. 2018. The relation between smartphone use and everyday inattention. *Psychology of Consciousness: Theory, Research, and Practice* 5, 1 (March 2018), 46–62. <https://doi.org/10.1037/cns0000131>
- [42] Gillian M McCarthy, Edgar R Rodriguez Ramírez, and Brian J Robinson. 2017. Participatory design to address stigma with adolescents with type 1 diabetes. In *Proceedings of the 2017 Conference on Designing Interactive Systems*. 83–94.
- [43] Elisa D Mekler and Kasper Hornbæk. 2016. Momentary pleasure or lasting meaning? Distinguishing eudaimonic and hedonic user experiences. In *Proceedings of the 2016 chi conference on human factors in computing systems*. 4509–4520.
- [44] Elisa D Mekler and Kasper Hornbæk. 2019. A framework for the experience of meaning in human-computer interaction. In *Proceedings of the 2019 CHI conference on human factors in computing systems*. 1–15.
- [45] Jessica S Mendoza, Benjamin C Pody, Seungyeon Lee, Minsung Kim, and Ian M McDonough. 2018. The effect of cellphones on attention and learning: The influences of time, distraction, and nomophobia. *Computers in Human Behavior* 86 (2018), 52–60.
- [46] Alexander Meschtscherjakov, David Wilfinger, and Manfred Tscheligi. 2014. Mobile attachment causes and consequences for emotional bonding with mobile phones. In *Proceedings of the 32nd annual ACM conference on Human factors in computing systems*. ACM, 2317–2326.
- [47] Alberto Monge Roffarello and Luigi De Russis. 2022. Towards Understanding the Dark Patterns That Steal Our Attention. In *CHI Conference on Human Factors in Computing Systems Extended Abstracts* (New Orleans, LA, USA) (CHI EA '22). Association for Computing

- Machinery, New York, NY, USA, Article 274, 7 pages. <https://doi.org/10.1145/3491101.3519829>
- [48] Jennifer N Morey, Amy L Gentzler, Brian Creasy, Ann M Oberhauser, and David Westerman. 2013. Young adults' use of communication technology within their romantic relationships and associations with attachment style. *Computers in Human Behavior* 29, 4 (2013), 1771–1778.
- [49] Andrew Ortony, Gerald L Clore, and Allan Collins. 1990. *The cognitive structure of emotions*. Cambridge university press.
- [50] Antti Oulasvirta, Tye Rattenbury, Lingyi Ma, and Eeva Raita. 2012. Habits make smartphone use more pervasive. *Personal and Ubiquitous computing* 16, 1 (2012), 105–114.
- [51] Luca Pancani, Emanuele Preti, and Paolo Riva. 2020. The psychology of smartphone: The development of the smartphone impact scale (SIS). *Assessment* 27, 6 (2020), 1176–1197.
- [52] Chunjong Park, Junsung Lim, Juho Kim, Sung-Ju Lee, and Dongman Lee. 2017. Don't Bother Me. I'm Socializing! A Breakpoint-Based Smartphone Notification System. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing*. 541–554.
- [53] Jestine Philip, Hossein Najmi, Leyla Orudzheva, and Elisabeth Struckell. 2017. Work life overlap in the millennial generation: The role of ubiquitous technology. *Journal of Strategic Innovation and Sustainability* 12, 1 (2017), 80–98.
- [54] Caroline Pitt, Ari Hock, Leila Zelnick, and Katie Davis. 2021. The kids are/not/sort of all right. In *Proceedings of the 2021 CHI conference on human factors in computing systems*. 1–14.
- [55] Aarathi Prasad and Asia Quinones. 2020. Digital Overload Warnings—"The Right Amount of Shame"? In *International Conference on Human-Computer Interaction*. Springer, 117–134.
- [56] Brian A. Primack, Ariel Shensa, César G. Escobar-Viera, Erica L. Barrett, Jaime E. Sidani, Jason B. Colditz, and A. Everette James. 2017. Use of multiple social media platforms and symptoms of depression and anxiety: A nationally-representative study among U.S. young adults. *Computers in Human Behavior* 69 (April 2017), 1–9. <https://doi.org/10.1016/j.chb.2016.11.013>
- [57] Leonard Reinecke, Stefan Aufenanger, Manfred E. Beutel, Michael Dreier, Oliver Quiring, Birgit Stark, Klaus Wölfling, and Kai W. Müller. 2017. Digital Stress over the Life Span: The Effects of Communication Load and Internet Multitasking on Perceived Stress and Psychological Health Impairments in a German Probability Sample. *Media Psychology* 20, 1 (Jan. 2017), 90–115. <https://doi.org/10.1080/15213269.2015.1121832>
- [58] Alberto Monge Roffarello and Luigi De Russis. 2021. Understanding, Discovering, and Mitigating Habitual Smartphone Use in Young Adults. *ACM Transactions on Interactive Intelligent Systems (TiiS)* 11, 2 (2021), 1–34.
- [59] Alan M Rubin. 2009. Uses-and-gratifications perspective on media effects. In *Media effects*. Routledge, 181–200.
- [60] James A Russell. 1980. A circumplex model of affect. *Journal of personality and social psychology* 39, 6 (1980), 1161.
- [61] Richard M Ryan and Edward L Deci. 2000. Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary educational psychology* 25, 1 (2000), 54–67.
- [62] Zhanna Sarsenbayeva, Gabriele Marini, Niels van Berkel, Chu Luo, Weiwei Jiang, Kangning Yang, Greg Wadley, Tilman Dingler, Vassilis Kostakos, and Jorge Goncalves. 2020. Does smartphone use drive our emotions or vice versa? A causal analysis. In *Proceedings of the 2020 CHI conference on human factors in computing systems*. 1–15.
- [63] Wally Smith, Greg Wadley, Sarah Webber, Benjamin Tag, Vassilis Kostakos, Peter Koval, and James J Gross. 2022. Digital Emotion Regulation in Everyday Life. In *CHI Conference on Human Factors in Computing Systems*. 1–15.
- [64] Statista. 2021. How much time on average do you spend on your phone on a daily basis? <https://www.statista.com/statistics/1224510/time-spent-per-day-on-smartphone-us/>. Retrieved January 27, 2023.
- [65] Statista. 2022. Number of smartphone subscriptions worldwide from 2016 to 2021, with forecasts from 2022 to 2027. <https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/>. Retrieved January 27, 2023.
- [66] Bas R Steunebrink, Mehdi Dastani, and John-Jules Ch Meyer. 2009. The OCC model revisited. In *Proc. of the 4th Workshop on Emotion and Computing*. Association for the Advancement of Artificial Intelligence Palo Alto, 62.
- [67] Denise Su, Megan K Torkildson, and Heidi Sales. 2017. Speed dating, love letters, and couples interviews: how to get the spark back in user research methods. In *Proceedings of the 19th International Conference on Human-Computer Interaction with Mobile Devices and Services*. 1–5.
- [68] Benjamin Tag, Niels van Berkel, Andrew W Vargo, Zhanna Sarsenbayeva, Tyler Colasante, Greg Wadley, Sarah Webber, Wally Smith, Peter Koval, Tom Hollenstein, et al. 2022. Impact of the global pandemic upon young People's use of technology for emotion regulation. *Computers in Human Behavior Reports* (2022), 100192.
- [69] Anushree Tandon, Amandeep Dhir, Intesar Almugren, Ghada Naif AlNemer, and Matti Mäntymäki. 2021. Fear of missing out (FoMO) among social media users: a systematic literature review, synthesis and framework for future research. *Internet Research* (2021).
- [70] Jonathan Tran, Katie Yang, Katie Davis, and Alexis Hiniker. 2019. Modeling the Engagement-Disengagement Cycle of Compulsive Phone Use. <https://doi.org/10.1145/3290605.3300542> Pages: 14.
- [71] Mariek M P Vanden Abeele. 2020. Digital Wellbeing as a Dynamic Construct. *Communication Theory* 31, 4 (10 2020), 932–955. <https://doi.org/10.1093/ct/qtaa024> arXiv:<https://academic.oup.com/ct/article-pdf/31/4/932/41146766/qtaa024.pdf>

- [72] Deedra Vargo, Lin Zhu, Briana Benwell, and Zheng Yan. 2021. Digital technology use during COVID-19 pandemic: A rapid review. *Human Behavior and Emerging Technologies* 3, 1 (2021), 13–24.
- [73] Vaishnavi Visweswaraiah, Tanvi Banerjee, W Romine, and S Fryman. 2021. Nomophobia before and after the COVID-19 Pandemic - Can Social Media be Used to Understand Mobile Phone Dependency. *Int J Clin Med Info* 4, 1 (2021), 31–43.
- [74] Victoria Waldersee. 2019. Could you live without your smartphone? <https://yougov.co.uk/topics/technology/articles-reports/2019/03/08/could-you-live-without-your-smartphone>
- [75] Claire A Wolniewicz, Mojisola F Tiamiyu, Justin W Weeks, and Jon D Elhai. 2018. Problematic smartphone use and relations with negative affect, fear of missing out, and fear of negative and positive evaluation. *Psychiatry research* 262 (2018), 618–623.

A ADDITIONAL FIGURES & TABLES

A.1 Categorization Figures

LAYER 1	design																		multimedia																																							
LAYER 2	service		whole smartphone	ubiquity	hardware design			UX	hardware production	information access	media production	media consumption	apps			navigation	settings	user behaviour	social communication	social media	tracking	notifications																																				
#	15 alarm	2 autocorrect	3 calculator	5 calendar	1 clock	4 flashlight	5 notes	9 reminders	1 remote control	2 ringtones	1 wallet	2 weather	37 whole smartphone	30 ubiquity	12 battery	9 durability	37 hardware design	1 storage	1 mobile data	3 operating system	1 updates	17 UX	3 hardware production	3 price	24 information access	10 news	12 camera	5 media production	1 microphone	4 games	17 media consumption	2 music	1 videos	9 apps	2 clarity apps	2 finance apps	1 food ordering	3 health apps	1 math app	2 screen time app	2 shopping	2 translate	26 navigation	1 flight mode	1 focus mode	1 silent mode	10 behaviour of others	19 own behaviour	3 e-mails	11 messaging	6 phone calls	56 social communication	21 social media	1 cookies	7 tracking	5 notifications	5	812
#	37 whole smartphone	30 ubiquity	12 battery	9 durability	37 hardware design	1 storage	1 mobile data	3 operating system	1 updates	17 UX	3 hardware production	3 price	24 information access	10 news	12 camera	5 media production	1 microphone	4 games	17 media consumption	2 music	1 videos	9 apps	2 clarity apps	2 finance apps	1 food ordering	3 health apps	1 math app	2 screen time app	2 shopping	2 translate	26 navigation	1 flight mode	1 focus mode	1 silent mode	10 behaviour of others	19 own behaviour	3 e-mails	11 messaging	6 phone calls	56 social communication	21 social media	1 cookies	7 tracking	5 notifications	5	812												

Fig. 6. Categorization of identified smartphone features.

SUM CATEGORY	#	SUB-CATEGORY	#	SUB-CATEGORY	#	SUB-CATEGORY	#	SUB-CATEGORY	#	SUB-CATEGORY	#	SUB-CATEGORY	#	SUB-CATEGORY	#	SUB-CATEGORY	#	SUB-CATEGORY	#	SUB-CATEGORY	#	
7 AGENCY																						
4 agency	0	self-control	1																			
5 loss of agency	3	loss of control	1	loss of self-control	1																	
4 wish for agency	1																					
107 RELATIONSHIP IN SMARTPHONE																						
22 addiction	20	overuse	1	toxic relationship	1																	
27 dependency	15	fear of loss	11	memories lost	1																	
54 attachment	10	companionship	42	symbolic relationship	1	mutual benefit	1															
4 pragmatism	2	no feelings towards smartphone	1	no benefit	1																	
104 BETTER QUALITY OF LIFE																						
55 easier life	8	more organized life	28	gain of time	3	convenience	3	satisfaction	2	reachability	1	opportunities	1	navigation	9							
18 better well-being	7	better quality of life	5	higher self-confidence	2	happiness	2	feeling of security	2													
30 easier	4	time well-spent	3	entertainment	11	memories	12															
30 empowerment																						
71 WORSE QUALITY OF LIFE																						
24 disrupted daily life	0	interruptions	3	loss of time	20	loss of productivity	1															
9 disconnection from the rw	0	risk of loss of reality	1	rabbit hole	5	dystopia	1															
22 lower well-being	15	lower quality of life	4	lower health	3																	
16 loss of skills																						
23 CONSIDERATIONS: ETHICAL, FINANCIAL, PRIVACY																						
7 costs	1	purchase costs	1	repair costs	3	maintenance	2															
ethical																						
9 consideration	0	ethical concerns	3	sustainability	5	(no) sustainability	1															
7 distrust	1	tracking	0	manipulation	3	exposure	3															
72 SOCIAL RELATIONSHIPS																						
44 social connection	0	social connection	43	(no)	1																	
social																						
19 disconnection	17	no social connection	1	damaged relationships	1																	
9 social pressure	6	constant availability	3																			
62 COPING STRATEGIES																						
30 disease	5	breakup	25																			
24 reduced usage (break)	0	break	16	strategy: reduce usage	4	strategy: turn off smartphone	1	strategy: put smartphone away		strategy: wants to delete what does not say how		strategy: self-reflection		strategy: cover camera with tape	1							
8 controlled usage	0	behaviour change	1	screen time app	2	strategy: use silent mode to avoid distractions		strategy: setting boundaries	2	(conscious use)												
15 NON-USE																						
7 FOMO	7																					
8 JOMO	5	real-world activities	3																			
461																						

Fig. 7. Categorization of identified real-life consequences.

A.2 Tables of *Emotion-Feature-Consequence* Links for the Identified Smartphone Roles

Table 6. ASSISTANT (positive)

	OCC Emotion	Feature Category	Consequence Category	Frequency
POSITIVE	gratitude	social communication	social connection	28
	love	service	-	14
	gratitude	service	easier life	13
	gratitude	navigation	easier life	8
	gratitude	information access	-	7
	love	information access	-	6
	gratitude	media production	escape	5
	gratitude	whole smartphone	easier life	5
	love	whole smartphone	-	5
	approving	information access	-	4
	approving	navigation	-	4
	gratitude	apps	easier life	4
	gratitude	social communication	better well-being	4
	love	apps	-	4
	love	social communication	social connection	4
	positive	information access	-	4
	approving	whole smartphone	-	3
	love	media production	-	3
	approving	media production	-	2
	approving	social communication	social connection	2
	gratitude	apps	-	2
	gratitude	apps	better well-being	2
	gratitude	information access	easier life	2
	gratitude	social communication	-	2
	gratitude	social communication	escape	2
	gratitude	whole smartphone	-	2
	gratitude	whole smartphone	better well-being	2
	gratitude	whole smartphone	social connection	2
	liking	service	-	2
	liking	service	easier life	2
	liking	whole smartphone	-	2
	love	media consumption	-	2
	love	social media	-	2
	positive	whole smartphone	-	2
	other			48
total positive				205

Table 7. ASSISTANT (negative/neutral)

	OCC Emotion	Feature Category	Consequence Category	Frequency
NEGATIVE	displeased	navigation	loss of skills	2
	distress	information access	FOMO	2
	fear	social communication	dependency	2
	remorse	whole smartphone	dependency	2
	disliking	tracking	-	1
	displeased	hardware design	costs	1
	distress	service	loss of skills	1
	distress	social communication	FOMO	1
	distress	ubiquity	-	1
	fear	ubiquity	dependency	1
	fear	whole smartphone	FOMO	1
	fear	whole smartphone	loss of skills	1
	gloating	social communication	social disconnection	1
	relief	whole smartphone	better well-being	1
	remorse	whole smartphone	disuse	1
	remorse	whole smartphone	loss of skills	1
	reproach	user behaviour	dependency	1
	shame	apps	loss of skills	1
	shame	navigation	loss of skills	1
	shame	service	addiction	1
	shame	social communication	loss of skills	1
	shame	social communication	social disconnection	1
	shame	ubiquity	social pressure	1
	shame	whole smartphone	loss of skills	1
				total negative
				26
NEUTRAL				2
POSITIVE	see Table 6			203
				total
				233

Table 8. COMPANION

	OCC Emotion	Feature Category	Consequence	Frequ.
POSITIVE	gratitude	whole smartphone	attachment	15
	joy	whole smartphone	attachment	6
	love	whole smartphone	attachment	4
	positive	whole smartphone	attachment	4
	love	ubiquity	attachment	3
	gratitude	whole smartphone	better well-being	2
	hope	whole smartphone	attachment	2
	positive	ubiquity	-	2
	satisfaction	whole smartphone	attachment	2
	approving	ubiquity	attachment	1
	gratitude	ubiquity	social connection	1
	liking	ubiquity	-	1
	love	hardware design	-	1
	love	hardware design	attachment	1
	love	whole smartphone	-	1
NEUTRAL	positive	ubiquity	attachment	1
	positive	whole smartphone	-	1
NEGATIVE	pride	whole smartphone	attachment	1
	neutral	whole smartphone	attachment	2
	neutral	ubiquity	-	1
	distress	whole smartphone	dependency	2
	fear	whole smartphone	dependency	2
	anger	ubiquity	social pressure	1
	disappointment	whole smartphone	reduced usage (break)	1
	displeased	whole smartphone	dependency	1
	remorse	ubiquity	dependency	1
	remorse	whole smartphone	loss of agency	1
	shame	whole smartphone	-	1
	shame	whole smartphone	dependency	1
total				63

Table 9. ENTERTAINER

	OCC Emotion	Feature Category	Consequence Category	Frequency
POSITIVE	gratitude	media consumption	escape	4
	gratitude	whole smartphone	escape	4
	approving	media consumption	-	2
	gratitude	media consumption	better well-being	2
	liking	media consumption	escape	2
	joy	media consumption	escape	1
	liking	social media	escape	1
	love	media consumption	escape	1
	love	service	-	1
	positive	information access	-	1
NEGATIVE	anger	apps	disrupted daily life	1
	shame	whole smartphone	loss of skills	1
				total
				21

Table 10. HINDERER

	OCC Emotion	Feature Category	Consequence Category	Frequency
NEGATIVE	anger	whole smartphone	lower well-being	2
	anger	social communication	lower well-being	1
	anger	whole smartphone	addiction	1
	anger	whole smartphone	disrupted daily life	1
	anger	whole smartphone	loss of skills	1
	anger	whole smartphone	social disconnection	1
	disappointment	whole smartphone	lower well-being	1
	disapproving	whole smartphone	disconnection from the rw	1
	disapproving	whole smartphone	disrupted daily life	1
	disapproving	whole smartphone	lower well-being	1
	distress	whole smartphone	disconnection from the rw	1
	distress	whole smartphone	loss of skills	1
	pity	whole smartphone	disuse	1
	remorse	whole smartphone	loss of skills	2
	remorse	navigation	dependency	1
	remorse	navigation	loss of skills	1
	remorse	social media	disrupted daily life	1
	remorse	whole smartphone	addiction	1
	remorse	whole smartphone	social disconnection	1
POSITIVE	hope	media consumption	reduced usage (break)	1
				total
				22

Table 11. NUISANCE

	OCC Emotion	Feature Category	Consequence Category	Frequency
NEGATIVE	anger	whole smartphone	disrupted daily life	3
	anger	UX	-	1
	anger	notifications	lower well-being	1
	anger	ubiquity	lower well-being	1
	anger	whole smartphone	disconnection from the rw	1
	anger	whole smartphone	lower well-being	1
	disappointment	whole smartphone	disrupted daily life	2
	disapproving	notifications	reduced usage (break)	1
	disapproving	whole smartphone	-	1
	disliking	notifications	-	1
	distress	media consumption	lower well-being	1
	distress	social media	disrupted daily life	1
	distress	whole smartphone	disrupted daily life	1
	distress	whole smartphone	lower well-being	1
	distress	whole smartphone	reduced usage (break)	1
POSITIVE	hate	service	controlled usage	1
	reproach	social communication	social disconnection	1
	reproach	ubiquity	disuse	1
	shame	notifications	FOMO	1
	shame	user behaviour	-	1
	shame	user behaviour	disconnection from the rw	1
				total
				31

Table 12. OBJECT

	OCC Emotion	Feature Category	Consequence Category	Frequency
NEGATIVE	anger	hardware design	disuse	1
	disapproving	service	disuse	1
	disliking	hardware design	disuse	1
	disliking	hardware production	costs	1
	fear	hardware design	dependency	1
	fear	whole smartphone	costs	1
	fear	whole smartphone	dependency	1
	hate	hardware production	ethical considerations	1
	pity	UX	disuse	1
	pity	whole smartphone	pragmatism	1
POSITIVE	reproach	user behaviour	ethical considerations	1
	shame	user behaviour	-	1
	love	hardware design	-	2
POSITIVE	gloating	hardware design	JOMO	1
	gloating	whole smartphone	JOMO	1
	gloating	whole smartphone	costs	1
	hope	whole smartphone	disuse	1
	joy	whole smartphone	-	1
	love	whole smartphone	-	1
	pride	whole smartphone	-	1
NEUTRAL	neutral	whole smartphone	-	1
			total	22

Table 13. OBSESSION

	OCC Emotion	Feature Category	Consequence Category	Frequency
NEGATIVE	remorse	whole smartphone	addiction	4
	remorse	whole smartphone	lower well-being	3
	remorse	user behavior	addiction	2
	remorse	apps	disrupted daily life	1
	remorse	apps	lower well-being	1
	remorse	information access	FOMO	1
	remorse	ubiquity	addiction	1
	remorse	user behavior	disrupted daily life	1
	remorse	user behavior	disuse	1
	shame	whole smartphone	addiction	2
	shame	user behavior	addiction	1
	shame	whole smartphone	disrupted daily life	1
	shame	whole smartphone	-	1
	hate	whole smartphone	addiction	2
	disapproving	apps	disrupted daily life	1
	disapproving	whole smartphone	addiction	1
	disapproving	whole smartphone	-	1
POSITIVE	distress	whole smartphone	addiction	1
	distress	whole smartphone	dependency	1
	distress	whole smartphone	social pressure	1
	other			3
	love	hardware design	attachment	1
	love	whole smartphone	attachment	1
	love	whole smartphone	dependency	1
	positive	social communication	attachment	1
	positive	whole smartphone	attachment	1
	liking	hardware design	-	1
		total		37

Table 14. VILLAIN

	OCC Emotion	Feature Category	Consequence Category	Frequency
NEGATIVE	distress	social media	lower well-being	2
	anger	media production	mistrust	1
	anger	service	mistrust	1
	anger	social communication	social pressure	1
	anger	tracking	mistrust	1
	anger	whole smartphone	disconnection from the rw	1
	anger	whole smartphone	disrupted daily life	1
	anger	whole smartphone	loss of agency	1
	anger	whole smartphone	loss of skills	1
	disapproving	media consumption	disrupted daily life	1
	disapproving	tracking	-	1
	disapproving	tracking	mistrust	1
	disapproving	whole smartphone	disuse	1
	disliking	hardware design	-	1
	distress	ubiquity	social pressure	1
	hate	social media	mistrust	1
	hate	tracking	-	1
	hate	tracking	mistrust	1
	hate	whole smartphone	lower well-being	1
	remorse	social media	social pressure	1
	reproach	whole smartphone	loss of agency	1
			total	22