The User's Experience. Exploring the Impact our Interactions with Technology Have on Us

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Technology is both a useful tool and a source of frustration. Researchers and product designers strive to predict and meet user needs by studying user intentions toward, and experiences with, technology. Such work has focused primarily on improving the user's device interactions to improve usability, while (largely) ignoring the effect that user frustration with technology has on their psychological well-being. We performed a questionnaire study (n=211) to assess users' feelings about their experiences with different aspects and types of technology when the technology performed contrary to their expectations. We found that technology that was frustrating to use or performed below user expectations led to the user reporting more negative feelings indicating that user frustration and feelings towards technology are an area for consideration in improving the interaction experience and user well-being.

Technology use. Need satisfaction/frustration. User experience. Well-being.

1. INTRODUCTION

From smart phones to smart homes and beyond, technology use has become widespread and permeated many areas of our lives across all life stages. Technological advances have resulted in a myriad of different devices that users have adopted, from phones, televisions, computers, to cars, and more (Ferreira et al., 2011; Forlizzi, 2018; Saxena et al., 2017). Such devices have made significant changes to our society and serve a number of functions in our lives as methods of communication, entertainment, security, and transportation (Forlizzi, 2018). Most of us interact with technology daily in some way, we use it to write papers, track our health data, pay for our purchases, and turn on the lights. Technology is so prevalent in our lives that it is likely harder to come up with aspects of our lives that technology has not impacted than it is to list the ways we have embraced technology in our daily lives.

This technological growth has been supported by works focused on improving the interaction experience of the user, where researchers and product designers strive to predict and meet user needs and improve the user experience by studying user intention towards technology and experience with it (Pucillo & Cascini, 2014). Such work has focused primarily on user interaction with the device to make the use of device more user friendly or navigable as technology that is frustrating to use is less likely to be adopted. In fact, not only can technology be frustrating to use, it may not always provide a positive experience for the user. While generally intended as a way to improve the users' lives, technology does not always afford a positive experience and consideration must be given to the ways in which technology can present a negative influence for the user (Shaw et al., 2018).

Given how common technology use is in most people's daily lives, it is important to consider the frustrations or negative influences technology use can introduce to a user. Particularly since frustrating or negative experiences can have an impact on a person's mental health and emotional well-being. Our technology use should be a pleasant experience for us, not a source of frustration that leads to negative feelings towards, or because of, it. To the best of our knowledge, the emotional or mental health impact of technology use on the user is an area that is under-explored in user experience and design research. As such, in this paper we explore the relationship between technology use and peoples' feelings about their interactions with it. We anticipate that users will have more negative feelings towards technology that is difficult to use or does not perform as well as expected and will have more positive feelings towards technology that is easy to use or performs at or beyond expectations. While this may seem somewhat obvious there appears to be little research that addresses the impact of frustrating technology use on user's psychological well-being and this paper is intended as a step towards closing that gap.

2. BACKGROUND

In this section we will provide a brief overview of the related work from a number of areas relevant to user interactions with technology, namely the areas of technology acceptance, use continuation, user motivation, and the user experience.

2.1 Technology Acceptance

The technology acceptance model (TAM) is a model used to study user acceptance of information technology that looks at the relationship between a user's behavioural intention towards the technology, specifically the perceived usefulness (PU) and perceived ease of use (PEU), and their adoption of that technology (Bruner II & Kumar, 2005; Davis, 1989; Peters et al., 2018; Son et al., 2012; Van der Heijden, 2004; Wixom & Todd, 2005). The PU of something pertains to a user's belief about how using the technology would improve their ability to perform a particular task or job, while the PEU of something pertains to the user's assessment of how effortless they believe the system would be to use (Bruner II & Kumar, 2005; Davis, 1989; Van der Heijden, 2004). The TAM was originally developed for predicting the adoption of information technology systems in the workplace (Davis, 1989) but has been extended to include measures of perceived enjoyment for the adoption of hedonic systems (Van der Heijden, 2004), the adoption of mobile devices by construction professionals (Son et al., 2012), and the acceptance of handheld devices by consumers of mobile commerce (Bruner II & Kumar, 2005). The TAM is not the only model that explains technology adoption, the unified theory of acceptance and use of technology (UTAUT) is another model that built on the TAM and incorporated it and seven other models to create a unified model to predict employee technology adoption within the organizational context (Venkatesh et al., 2012). The UTAUT has four variables, performance expectancy and effort expectancy which are essentially equivalent to the PU and PEU of the TAM, social influence, the user's perception that others feel they should adopt the technology, and facilitating conditions, the user's perception of the support available to enable use of the technology (Venkatesh et al., 2012). The UTAUT was extended as the UTAUT2 to predict consumer acceptance by adding three variables that influence consumer acceptance, hedonic motivation, to assess the pleasure of using the technology, price value, for the financial impact to the consumer, and habit, developed by prior experience with the technology (Venkatesh et al., 2012).

2.2 Use Continuance

The continued use of a technology, rather than the initial adoption of it, is critical as the continuance of use is what determines the success of a technology (Bhattacherjee, 2001; Yan et al., 2021). The expectation-confirmation model (ECM) is a model used to study continuance of use of information systems post adoption that contends that user satisfaction is the strongest indicator for use continuance (Bhattacherjee, 2001). Satisfaction in the ECM is achieved when the users PU for the technology is confirmed through their use of it resulting in a satisfactory experience with the technology and an intention to continue using it (Bhattacherjee, 2001; Nascimento et al., 2018). While originally developed for information systems the ECM has been adapted for studying continuance intentions for numerous technologies including wearables showing that user satisfaction is an important factor in across technology types (Nascimento et al., 2018; Yan et al., 2021). The importance of user satisfaction for continuance of use has also been demonstrated in other models of continuance use such as the Technology Integration Model (TIM) which posits that continuance is determined by the satisfaction of a user's intrinsic and extrinsic motivations towards the technology (Shaw et al., 2018).

2.3 User Motivation

User's decisions regarding technology acceptance or continuance are based on their beliefs about a variety of factors pertaining to technology use and its value to them (Wixom & Todd, 2005). These motivations towards use can be generally divided into two categories, extrinsic, or goal-oriented utilitarianism, and intrinsic, or hedonistic enjoyment (Shaw et al., 2018; Van der Heijden, 2004; Venkatesh et al., 2012). Essentially, our decision to use a technology is based on whether we need to use it in order to accomplish a required task or whether we want to use it as a source of fun or pleasure. Even when used for utilitarian purposes, user satisfaction with a technology is higher when the user receives some intrinsic pleasure or enjoyment from using it (Hassenzahl et al., 2010; Shaw et al., 2018; Venkatesh et al., 2012; Wixom & Todd, 2005) indicating that even in a situation where the technology use is required the users want the technology to be pleasant to use.

Interestingly, prior research has shown that habits developed from prior experience with the technology moderate the level of satisfaction a user derives from engaging with it (Cheung & Limayem, 2005), regardless of whether their usage was intrinsically (Nascimento et al., 2018) or extrinsically (Venkatesh et al., 2012) driven. In fact, the more habituated the user is to a technology the less their satisfaction with it matters for their intention to use it, as user intention is more strongly related to habit than it is to satisfaction (Cheung & Limayem, 2005; Ouellette & Wood, 1998) inferring that users will use a technology not because they want to or enjoy it, but simply because they have become accustomed to it.

2.4 User Experience

User adoption, continuance, and motivation combine leading to the user experience (UX) which is the of-the-moment feeling a user has while interacting with a product in order to competently achieve their intended goals and need fulfillment (Hassenzahl, 2008; Hassenzahl et al., 2010). In short, a person has a goal to meet and utilizes a specific object that affords them the ability to accomplish this goal thus becoming a user of that object and having a user experience with it (Pucillo & Cascini, 2014; Redström, 1997). As the user experience does not exist until a person becomes a user and interacts with the object, the object can be designed only to what the designer predicts the intended user's intentions to be (Redström, 1997). These predictions are made based on assumptions about the psychological needs a user would want to have fulfilled by using the object, needs that are in large part based off of Mazlow's universal needs identified in his 1954 work *Theory of Personality* and, in the case of user experience, geared toward technological interaction encompassing the needs of autonomy, competence, meaning, popularity, relatedness, security, and stimulation (Hassenzahl et al., 2010). These seven needs are found to be positively correlated to a positive interaction with the specified technology in situations where the user associated the positive result they achieved to the use of a particular technology (Hassenzahl et al., 2010) but fail to include the emotional impact or response a user may face when interacting with technology. In other words, the emotional need of pleasure or enjoyment of the user appears to not be factored into user experience design (Peters et al., 2018) despite the fact that the industry standards for user experience explicitly state that emotional aspects are a component of user experience (ISO, 2010).

2.5 User Satisfaction and Frustration

Clearly the user's experience and all steps leading towards it are predicated on user satisfaction. This is highly logical, technology that does not satisfy the user's need(s) will not be used. However, recent psychological research shows that need satisfaction and need frustration are *two different constructs* and need satisfaction does not preclude simultaneous need frustration leading to negative psychological states (Chen et al., 2015; Longo et al., 2018; Peters et al., 2018; Tindall & Curtis, 2019). The *Self-Determination Theory* in psychology maintains that there are three basic psychological needs essential to psychological well-being and that the frustration of them causes psychological ill-being, these needs are autonomy, competence, and relatedness (Chen et al., 2015; Longo et al., 2018; Peters et al., 2018; Tindall & Curtis, 2019). These needs as separate constructs and their correlation to well-being

(satisfaction) and ill-being (frustration) have been found across multiple cultures around the world (Chen et al., 2015; Peters et al., 2018). As these three basic psychological needs are some of the needs previously listed that determine the value of the use of technology for the user, this field of research is of value to the HCI community as a way to avoid creating technologies that frustrate a need, and thus cause user ill-being, while satisfying another need (Peters et al., 2018).

3. CURRENT STUDY

The current study is part of a future work on people's behavioural outcomes in response to various commonplace life scenarios and their personality types. As technology use has become so prevalent in everyday life, and the types of technology are so varied, we decided to do a preliminary study on a wide variety of technology scenarios to determine whether the inclusion of a technology scenario would be suitable for the main study. Our hypothesis for the current study was that people's experiences with technology would have an impact on their feelings about their use of the technology where the direction of the experience (positive or negative) corresponded to a change in feeling in the same direction.

3.1 Participants and Procedure

We developed an English language questionnaire to assess user's feelings about their interactions with technology-enabled devices and hosted an online survey through Survey Monkey. The link to the study was distributed via Survey Circle, Reddit, and Facebook and was available to any user of those platforms that saw the invitation and chose to participate. For the latter two the link was shared through moderator approved posts in public groups. The questionnaire consisted of an informed consent form followed by twenty questions divided into two sections. The first section asked participants to respond to 8 demographic and preference questions, the second part consisted of 12 scenario questions for different interactions with technology. The first part of the survey was optional while the second part was required, all participants that responded to the second section also answered the optional first section. Participants were informed at the top of each survey page that they could exit the survey at any time without submitting their results by closing the browser window as only submitted results would be collected.

The second section of the survey presented scenarios in which a technology performed in a manner that either was below expectations or exceeded them. The presented scenarios were ones that an average user could face in their interaction with a device or easily imagine being in

the situation described. For example, a card reader not recognizing the presented card or an illuminated smart lock lighting up the keypad for an exterior door in the dark. We provided one scenario each for the following twelve technologies: activity monitors, autocorrects, battery drain, blind spot monitoring, card readers, device connectivity, facial recognition, GPS systems, illuminated keypads, screen flicker, speech recognition, and system updates. For each scenario respondents were asked to answer how the presented scenario would influence their feelings about using the technology. Responses were made on a seven-point Likert scale ranging from "significantly negative" (1) to "significantly positive" (7), except for blind spot monitoring, GPS systems, and illuminated keypads which were all reverse coded as they presented scenarios anticipated to exceed user expectations. For all questions (4) indicated "no change" or neutral. Each question provided an optional comment field for respondents to provide additional information.

4. RESULTS

Demographic and preference questions were asked only to assess whether the survey distribution methods used would reach a varied population. Thus, they were not used for any statistical purposes other than determining their percentage of the responses. In total 233 people responded to the survey invitation, 211 of whom submitted the required second part of the survey for a completion rate of 90.5%. The sample included 131 (62.1%) females, 74 (35.1%) males, and 6 (2.8%) other gendered respondents. The ages for all participants ranged from under 19 (8.5%) to over 70 (4.3%) with the vast majority of respondents being between 20 - 29 years of age (61.1%). Most participants self-reported owning between 2 - 4 computing devices (77.7%), that their technology skill level was intermediate (39.8%) or advanced (44.5%), and that they considered themselves to be a realist (52.1%) over an optimist (29.0%) or pessimist (18.0%). See Table 1 for respondent demographic data and Table 2 for technology ownership and experience data.

Table 1: Respondent characteristics of age, gender, personality type.

Age	n	%
19 AND UNDER	18	8.5
20 – 29	129	61.1
30 – 39	26	12.3
40 – 49	16	7.6
50 – 59	13	6.2
60 AND OVER	9	4.3
Gender	n	%
FEMALE	131	62.1
MALE	74	35.1
OTHER	6	2.8

Personality Type	n	%
Optimist	61	29.0
Pessimist	38	18.0
Realist	110	52.1
Other	2	0.1

Table 2: Respondent characteristics of number of devices owned and technological skill level

Devices Owned	n	%
1	4	1.9
2 – 4	164	77.7
5 – 7	34	16.1
8 – 10	7	3.3
Over 10	2	1
Technology Skill Level	n	%
Novice	9	4.3
Intermediate	84	39.8
Advanced	94	44.5
Expert	23	11.0
Other	1	0.4

Additionally, we asked participants about their preferences for their main computing device, operating system, and browser. 97 (46.2%) respondents indicated that they predominately used a smartphone as their main device with 77 (36.7%) respondents using a laptop as their main device. 76 (36.2%) respondents listed iOS as their main operating system with 64 (30.5%) using Windows. This distribution suggests that the majority of respondents use an iPhone as their main device with Windows based laptops being a close second. In regard to the browser most commonly used an overwhelming majority of respondents (127 or 60.2%) listed Chrome with Safari being the next most used browser by 39 (18.5%) participants. A full breakdown of participant technology preferences can be seen in Table 3.

Table 3: Respondent Technology Preferences

| Main Computing Device	n	%
Desktop Computer	33	15.7
Laptop	77	36.7
Smartphone	97	46.2
Tablet	3	1.4
Operating System	n	%
Android	37	17.6
Linux	5	2.4
iOs	76	36.2
OSX	28	13.3
Windows	64	30.5
Browser	n	%
Chrome	127	60.2
Firefox	22	10.4
Internet Explorer	4	1.9
Microsoft Edge	10	4.7
Safari	39	18.5
Other	9	4.3

The survey data was exported from Survey Monkey and cleaned up in R to exclude responses from participants who did not complete the second part. The cleaned-up data was then analyzed in R to provide the summary counts reported in Tables 1, 2, and 3 and we performed one sample t-tests for each technology scenario to test if the response was significantly different from neutral. Table 4 presents the descriptive statistics for each of the twelve items measured, the reverse coded items of blind spot monitoring, GPS systems, and illuminated keypads are marked by * in the table.

As anticipated, we found that for the scenarios in which the technology was difficult to use or performed below expectations: autocorrects, system updates, facial recognition, card reader, battery drain, activity monitor, speech recognition, device connectivity, and screen flicker; users reported negative feelings about their experience with the technology. For two of the three scenarios that presented technology that exceeded expectations we found that, as anticipated, users had positive feelings about their experiences with illuminated keypads and GPS systems. For the third scenario that exceeded expectations, blind spot monitoring, we found that, contrary to our expectations, users reported negative feelings towards the technology if it was too sensitive. For all twelve scenarios we found a significant difference from neutral. The distributions of users change in feelings towards the use of technology is shown in Figure 1.

Table 4: *Descriptive Results from Questionnaire*

Technology Type	Mean	Sd	T(210)	p-value
ILLUMINATED KEYPADS	*5.18*	*1.30*	*13.181*	*p < 0.001*
*GPS SYSTEMS**	*5.00*	*1.75*	*8.262*	*p < 0.001*
AUTOCORRECT	*3.76*	*1.44*	*-2.394*	*p < 0.05*
*BLINDSPOT MONITORING**	*3.33*	*1.67*	*-5.8399*	*p < 0.001*
SYSTEM UPDATES	*3.47*	*1.28*	*-6.0195*	*p < 0.001*
FACIAL RECOGNITION	*3.25*	*1.50*	*-7.2424*	*p < 0.001*
CARD READER	*3.25*	*1.20*	*-9.1401*	*p < 0.001*
BATTERY DRAIN	*3.13*	*1.16*	*-10.901*	*p < 0.001*
ACTIVITY MONITOR	*3.00*	*1.27*	*-11.453*	*p < 0.001*
SPEECH RECOGNITION	*2.91*	*1.23*	*-12.842*	*p < 0.001*
DEVICE CONNECTIVITY	*2.58*	*1.32*	*-15.699*	*p < 0.001*
SCREEN FLICKER	*2.31*	*1.32*	*-18.716*	*p < 0.001*
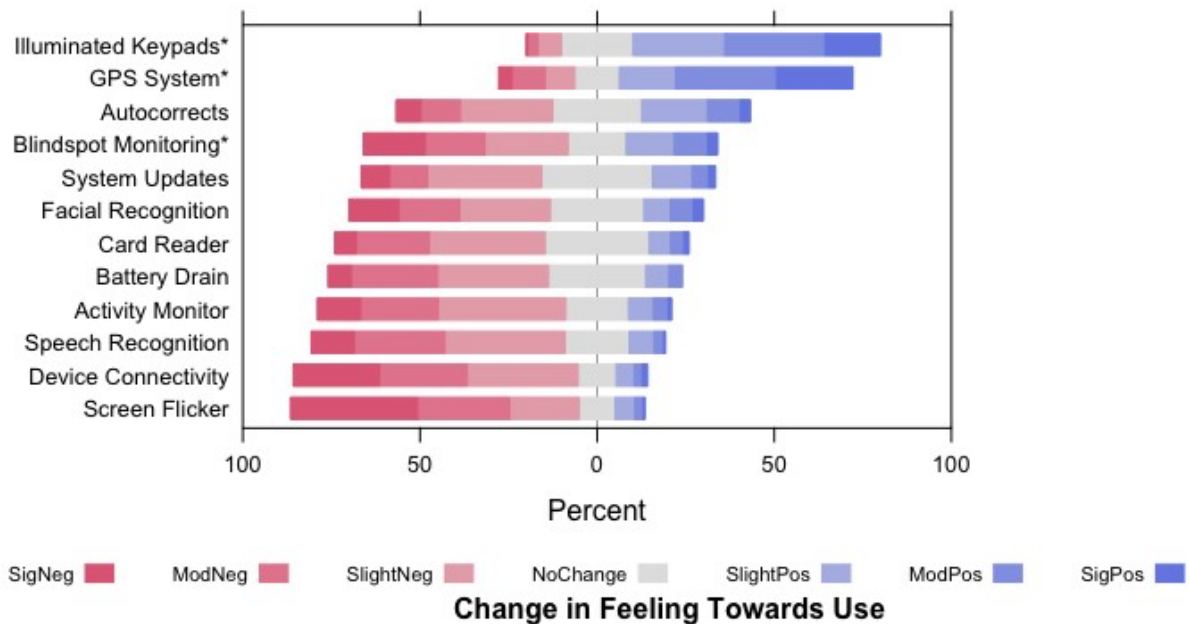
Figure 1: *Diverging stacked bar chart illustrating participant responses to the investigated scenarios.*

Given that the data on user characteristics (predominantly female respondents aged between 20-29 as shown in table B1) and technology preferences (most respondents prefer iOS smartphones as shown in table B3) was collected to assess the usefulness of the survey distribution tools and not intended to be analyzed, we did not investigate any correlations between either user

characteristics or technology preferences and the results.

In addition to the quantitative results above the results of the current study clearly support the research question about user's feelings about their interactions with technologies that are either difficult to use or perform below user expectations qualitatively. The areas with the strongest negative feelings were in response to screen flicker, the described condition being a display screen flickering each time the information presented on it changed, and device connectivity, the described condition being difficulty connecting data or charging cables to a device due to difficulty seeing or locating the connection point on the device. In both scenarios the provided optional comments also indicate strong negative feelings. In response to device connectivity respondents provided statements such as *"Broken"* (P195), *"It's very annoying when things like this happen"* (P86), and *"This is the norm. It would be epic if it wasn't. My answer is based on me being "moderately annoyed" EVERY single time I try to sync a device"* (P117) and statements such as *"This would make it almost unusable"* (P102), *"That would upset my autism and give me a headache"* (P181), and *"The year is 2021, come on"* (P195) in regard to screen flickers.

For technologies that are easy to use or perform at or beyond user expectations the results were mixed. Participants showed a clear response for positive feelings towards illuminated keypads, the described condition being smart locks for keyless entry that have an illuminated number pad to aid nighttime use, and GPS systems, the described condition being aiding in locating persons in rescue or emergency situations based on the last known location of the GPS enabled device. For the illuminated keypads the provided optional comments also indicate strong positive feelings. Users stated: *"The light function is REQUIRED for me"* (P181), *"I already have one of those and love it. The lightened key pad makes inputting my code easier"* (P70), and *"I currently have a smart lock with an illuminated keypad and I love it!!"* (P120) The provided comments for GPS systems are more varied as participants have concerns about the software but also see the value in using it. Users made comments such as *"There is a bit of a reluctance in privacy issues but to find people in emergencies is a great feature"* (P86), *"I don't *like* that I can be tracked, but the benefit of being able to get places is worth the creepiness"* (P99) and *"We're all being tracked in a million different ways. If this can help save me or others in an emergency, hell yes!"* (P186)

Somewhat surprisingly we found that users reacted negatively to one technology that performed above expectations, blind spot monitoring. In this scenario the described condition was a blind spot monitoring system on a car that alerted when driving past large stationary items, such as a mailbox, on the side of the road. We had anticipated that this would be a beneficial feature, and in fact a number of respondent comments such as *"I'd rather it tell me everything!"* (P93) and *"This would be positive. Rather have extremely sensitive blind spot monitoring than poor blind spot monitoring"* (P216) indicate this but user's feelings about their experiences with this technology were actually negative. A review of the provided comments seems to indicate that a sensitive warning system is undesirable to users as *"It would be very annoying and distracting"* (P222) and *"I hate this technology because it doesn't help people learn to pay attention when driving"* (P159).

Another interesting finding of the study comes from the questions about autocorrects and system updates. In both scenarios the respondents report negative feelings towards the technology but the provided comments seeming to indicate that, while the users dislike them, they view both as something they have to accept. For example, *"Updates are a fact of life"* (P33) or *"My autocorrect now corrects some words to the misspelling I make (so just usually corrects to jist) it's funny but gets annoying when I have to reset it now and then"* (P205). This seemingly indicates that in certain situations users have become habituated to technology that performs below their expectations and that they feel negatively towards it but accept it as simply the way things are.

5. DISCUSSION

This paper and the study reported in it are intended not as a solution or a criticism but as a way to highlight an important area that should be considered for future attention. The types of devices available to consumers, and even how we interact with the devices, is constantly changing, the consumer market for technology is ever-developing (Bruner II & Kumar, 2005; Venkatesh et al., 2012) and the products that are more likely to be adopted are those that fulfill user needs in innovative ways (Saunders et al., 2011). The intention of UX is to create products that satisfy the predicted need the user needs to use the technology to meet. However, these needs are about what the technology does for the user, and not what using the technology does to the user's emotional state or basic psychological needs. As the findings from the current study show, technology can accomplish its assigned task but in a way that creates a negative feeling to the user. This means the technology goal is met and the users' intended need was satisfied, but at a cost to the user due to the frustration of another need. Given that hedonic motivation is one of the variables in UX it may, on the surface, appear that user emotions are a factor in product planning and

design. However, there is a significant difference between hedonic motivation from the UX perspective and a pleasurable user experience. As discussed above, hedonic motivation is the intention to do something for a non-utilitarian reason, this is not the same as having a positive feeling about an interaction.

A gap in existing research is an understanding or explanation of the core relationship between human feelings and technology. Exploring the interaction of both human and technological variables is thus necessary in order to develop a comprehensive understanding of technology use (Shaw et al., 2018). The variables currently used to study this topic are the ones cited in the models discussed above, which (excepting the TIM) are some of the most frequently used models to explain intentions towards technology use (Yan et al., 2021). Technology acceptance is based on PU, PEU, social influence, available support, hedonic motivation, price value, and habit. Continuance of use is based on expectation confirmation for the PU and the users intrinsic and extrinsic motivation. Motivation is satisfied if the user receives some intrinsic pleasure from the use, but habit reduces the level of satisfaction and then use happens because the user is habituated to the interaction not satisfied by it. Combined this means that a user will adopt and use a technology if they believe others expect them to use it and that it will be useful and easy to use. They will continue using the technology if it continues to satisfy their intended needs or without any need satisfaction if they have become habituated to it. This habituation is clearly illustrated in respondent's comments about autocorrects and system updates.

This is not meant to infer that the intersection of psychological well-being and technology is not considered by the HCI community. There has been some interesting work in regard to emotions and technology use. Users in a negative emotional state are more likely to make number entry errors in data entry (Cairns et al., 2014), the emotions a user are experiencing will influence what apps they interact with on their mobile device (Sarsenbayeva et al., 2020), and some designers use journey maps to create an outline of a user's experience over time and how they feel about the experience at each measured touchpoint in the interaction (Howard, 2014). While such works may seem to address the point raised in this paper, they are actually the inverse as they investigate how the emotions the user is experiencing influence how they interact with the technology and the point being made in this paper is how the technology use influences the user's feelings or emotions needs to be considered.

Additionally, behaviour change technology has become an area of increasing research interest as HCI researchers continue to explore ways to design technologies that support changes in user's behaviours from increasing physical activity to sustainability and energy-efficiency (Forlizzi, 2018; Hekler et al., 2013; Irizar-Arrieta et al., 2020; Peters et al., 2018). Such technologies are designed to cause a change in the behaviour of the user, they are something the user engages with in order to change something about themselves (Hekler et al., 2013; Peters & Calvo, 2021). As with the research into emotions and technology use, behaviour change technology research approaches the psychology- technology interaction as the user engaging with technology as an intentional action driven by their psychological state, an approach that is very important. However, equally important is the inverse of that relationship which is the unintended psychological state that interacting with a technology causes for the user.

Over the years there have been a number of shifts or changes in the focus of HCI with different lenses, paradigms, or waves as HCI research has continuously adapted and grown as technology has become more pervasive (Forlizzi, 2018; Frauenberger, 2019). Over the last few years the community has seen an increasing number of calls for change to help direct the next phase of HCI research such as the recent focus on behaviour change technologies (Hekler et al., 2013; Irizar-Arrieta et al., 2020; Peters et al., 2018), the call for a shift from UX and user-centered design to service framing (Forlizzi, 2018), the proposal for Entanglement HCI as the next evolution in design (Frauenberger, 2019), and the call to better understand and design for the psychological needs and experiences of the user (Peters & Calvo, 2021; Peters et al., 2018). It is clear that the HCI community is reaching a point where another shift in focus is necessary although what that shift includes or looks like is not yet clear. As part of that discussion we would like to encourage consideration of the psychological impacts on the user resulting from their technology interactions. The current study found that users are frustrated by their interactions with technology, an experience that is associated with negative psychological states and experiences. Thus, designing methods to resolve everyday frustrations in common technologies may be worth exploring as a way to improve the user experience and a way to address the one of the current calls to the HCI community. By satisfying the technological need without frustrating a psychological one we may be able to improve user experience in a small way that could have a significant positive impact for the person using it.

There are some limitations in the current work. First, this is an exploratory survey and as such does not go into the detail that an in-depth user study would. Participants were asked to respond to how they thought they would feel in the described scenario and did not interact directly with any of the devices as part of the study. However, given that all

scenarios are ones that are not atypical to experience it is likely that the respondent's answers are indicative of their feelings when in the described situation. Additionally, as discussed in the results section, the participant sample was unevenly distributed in terms of gender, age, and technology preferences which could limit the generalizability of the findings to the general public. In particular, the predominance of iPhone users may bias the results to that user group. Further studies should be conducted with a more balanced sample. Finally, as the current study was interested in exploring technology use quite broadly no geographical constraints or questions were included and the survey was distributed through online channels accessible globally. This approach results in no data on the geographical distribution of responses and thus generalizability is again limited. However, these are limitations only of generalizability and do not negate the value of the findings of this study, particularly for the demographic most represented in the current study.

6. CONCLUSION

While the determination on whether to include a technology scenario in our work on behavioural outcomes to commonplace life scenarios has not yet been made, the current study did yield results that were quite interesting and may be worth further exploration by the HCI and psychology communities. Design is an iterative process, products are continually revised and updated with new models showcasing innovative new features being frequently released, improving something does not mean the existing thing is bad, it simply means there is a way to make it better. Over the years there has been much research that has focused on improving user interactions with technology, but such work has mainly focused on improving the usability of a device not the effect the device use has on the user. This paper has provided a brief overview of some of the overarching themes in these prior works as well as presented the results of an exploratory study on user's feelings about their interactions with technology. In our questionnaire assessing user's feelings about their experiences with technology we found that technology that performed below a user's expectation resulted in the user having negative feelings about their interaction with the device. These findings indicate that user feelings about their technology interactions are an important aspect of the user experience that ought to be considered by UX researchers and designers. Researchers have been making calls for change to direct the future of HCI research (Forlizzi, 2018; Frauenberger, 2019; Hekler et al., 2013; Irizar-Arrieta et al., 2020; Peters & Calvo, 2021; Peters et al., 2018). That future should include consideration of the user's psychological satisfaction not only the

technological need satisfaction. Technology is here to stay and our interactions with it should not be a source of negative emotions or ill-being for its users. We need to look not only at what the technology does for us but also what it does to us.

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