Pet Phone: Using Apologies to Enhance User-Smartphone Attachment

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ABSTRACT

This paper presents a method for enhancing the emotional bond between a smartphone and its user by engaging in the social script of apology. Using the Pet Phone application, users are prompted to apologize to their smartphones after perceived slights via pop-up notifications that appear on the screen, accompanied by a vibration pulse. We studied the effect of the Pet Phone on participants who ran the application on their own smartphones for 5 days. Analysis was performed using logged sensor data as well as pre- and post-experiment questionnaires. The majority of participants showed an increase in attachment after the experiment period, though it is unclear whether or not this translates into a tangible change in behaviour. Nevertheless, the results suggest that there is potential for further work in enhancing user-smartphone attachment through the use of apology.

CCS Concepts

• **Human-centered computing**→**Smartphones**

Keywords

Emotional Attachment; Apology

1. INTRODUCTION

Smartphones are an increasingly ubiquitous technology in many parts of the world. However, the rapid advancement in smartphone technology and its accessibility has led to a correspondingly short smartphone replacement cycle. There is a significant subset of users who replace their phone every 1-2 years [6], either because they feel they must have the latest, incrementally improved models, or simply because they have been careless with the phone and had lost or broken it.

This short replacement cycle, shown in Figure 1, is problematic in that the excessive electronic waste it generates is environmentally unsustainable. More directly to the user, it causes some inconvenience in the form of additional monetary expense to purchase a new device, as well as the time and effort takes to configure a brand new device.

This project aims to lengthen the smartphone replacement cycle by enhancing user-smartphone attachment. The chosen mechanism for enhancement is through the social script of apology. We present an Android application designed to prompt the user to engage in apologetic interactions with their phone after perceived transgressions. We then study the effect of this application on smartphone users,
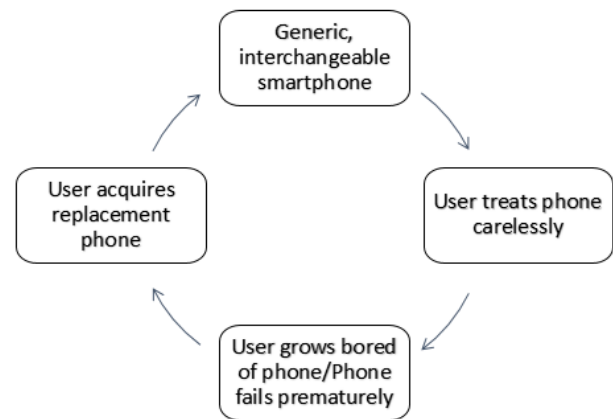
Figure 1. Smartphone replacement cycle

using both objective (sensor logs) and subjective (questionnaire) data.

2. BACKGROUND

2.1 Consumer-Product Attachment

Consumers are more likely to hang onto products to which they are emotionally attached [11]. In consumer psychology, the concept of consumer-product attachment has been studied extensively, though there is no standard agreed-upon definition for the term. Wehmeyer [16] explored attachment between users and feature phones (non-smartphone devices) using idea of attachment as a measure of self-extension, first introduced by Ball and Tasaki [1]. In both of these cases, the "product" in the consumer-product relationship is viewed as a passive object onto which the user projects their own image.

However, modern smartphones have much more potential for two-way interaction. For our purposes, we define consumer-product attachment to be *the emotional bond between a product and its consumer* (in this case, a user and their smartphone). This definition is in line with that of Schifferstein and Zwartkruis-Pelgrim, who go on to split the concept into four components: attachment, irreplaceability, indispensability and self-extension [10].

The additional functionality introduced by smartphones and their associated applications has pushed them away from being simply portable telephones, to being miniaturized, portable computers, with users responding accordingly [11]. This opens up new ways of looking at the relationship between smartphones and users, namely through the lens of human-computer interaction.

2.2 Computers Are Social Actors

The Computers Are Social Actors paradigm posits that humans interact with computers socially, and seeks to evaluate these interactions by applying "social rules" to interactions between humans and computers [8]. In the case of apologies, there is no single agreed-upon definition [12]. However, it is generally agreed across disciplines that there is a basic structure to an apology: acknowledgment of wrongdoing, expression of remorse, and promise of forbearance.

By creating opportunities for interaction following this basic structure (or "social script"), we hope to encourage users to see their smartphone as a social actor, with whom an emotional bond may be formed.

2.3 You Are What You Do

The affordances provided by objects in a person's environment affect the way that they interact with the world, which, over time, can affect a person's self-perception. Czikszentmihlyi [5] gives the example of a child playing with a baby doll: the child is prompted (explicitly or implicitly) to adopt a caretaking role toward the doll, eventually leading to a self-perception that "I am someone who takes care of dolls". A child who is given a toy gun would have a very different relationship with it, and lead to a different self-perception over time.

We extend this concept to encourage a smartphone user to adopt a more caretaking role toward their phone. By prompting the user to apologize for perceived transgressions, we can create the self-perception that "I am someone who is concerned for my phone's well-being", thus forming an emotional connection between user and phone. It is worth noting that the apology may not need to be entirely heartfelt and sincere, as superfluous apologies still demonstrate empathetic concern [3].

3. RELATED WORK

Previous studies on consumer-product attachment (many of which are mentioned above) have been focused on measurement and evaluation of attachment. Efforts for attachment *enhancement* have generally been focused on consumer-brand attachment (e.g. [9], [14]) or employee-company attachment (e.g. [4]).

Virtual pets, such as the Tamagotchi, have existed for decades, and much has been written (e.g. [2], [13]) on the interactions between humans and virtual agents. In these cases, the primary function of the agent is to facilitate interaction for the sake of interaction, and interactions are entirely voluntary on the part of the user. In contrast, a smartphone has a more utilitarian purpose. Many users are obligated, for personal or professional reasons, to interact with their smartphone or similar device regularly throughout the day, which presents many more chances for a novel aspect of interaction (such as the apology scheme presented in this study) to integrate itself in a user's everyday routine.

4. THE PET PHONE APPLICATION

An Android application was created to produce apology prompts in response to certain events triggered by a user's (mis-)handling of their phone. When an apology event is triggered, the user is prompted to go to the app home screen via a pop-up notification and vibration pulse.

4.1 Apology Notifications

An example notification is shown in Figure 2. Triggers for apology were based on excessive CPU usage, battery level, accelerometer spikes, and excessive "waking" (unlocking) of the phone. It was necessary to set the thresholds for these triggers to be fairly sensitive (i.e. easily triggered) in order to ensure that a sufficient number of events would occur during the evaluation period. A full list of events and triggers is shown in Table 1.
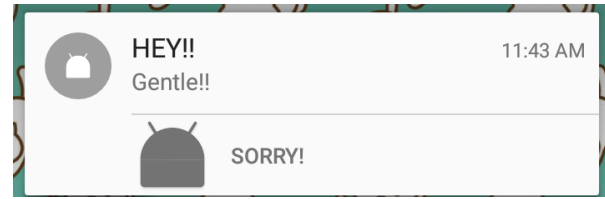

Figure 2. Notification example (triggered by "Phone Dropped")

**Table 1. Full list of apology event notifications**

Event	Notification Title	Notification Content	Respond Button
CPU over 30% usage	>____<	CPU is doing work	Sorry! I will turn it down soon!
Battery below 50%	0____0""	Getting kind of hungry	Sorry! Just a moment
Battery below 35%	@____@	Feed me please	Sorry! Just a moment
Battery below 20%	X____X	Too weak… Need food…	Sorry! Just a moment
Battery charging	:D	(Eating eating)	That looks tasty
Unlock 4 times	>____>	Can't you see I am sleeping?	Oops! Sorry..
Power Plugged	^____^	Food Time!	Sorry it took so long!
Power Unplugged	T____T	No more food	Sorry! I will charge you more next time
Phone Dropped	HEY!!	Gentle!!	Sorry!

4.2 Application Home Screen

By default, the app screen shows a "happy" face and greeting. When an apology is triggered, the app screen responds by switching to a different face and message. Figure 3 shows an example of the default and response screens. In order to reset the screen back to default after an apology event, the user must tap the apology button at the bottom of the screen.

Unicode emoji were used for simplicity of implementation (no need to load additional images). Though this does mean there was some variation in exactly what each user saw (since some phone manufacturers have chosen to depart from the default Android "blob" style emoji), it also means that users were greeted with the emoji style that they are already familiar with and possibly already associate with their phone.

The specific expressions for each response are shown in Table 2. These were selected through an online survey (N=43), where participants were asked to select the most appropriate emoji for each situation from a multiple-choice list.
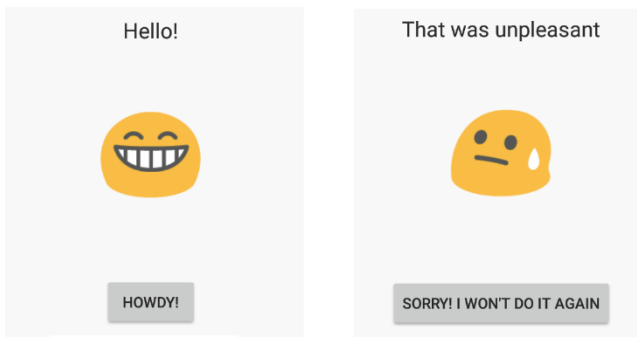
Figure 3. App screen examples (L: Default, R: triggered by "Phone Dropped")

Table 2. Home screen response to apology events

Event	Emoji (Google Default)	Emoji Unicode	Phone Phrase / Button text
Default		0x1F601	Hello! / Howdy!
Default (battery <50%)		0x1F612	Hungry… / Sorry! Just a moment
Battery below 50%		0x1F610	Getting kind of hungry / Sorry! Just a moment
Battery below 35%		0x1F635	Feed me please! / Sorry! Just a moment
Battery below 20%		0x1F616	Too weak.. Need food.. / Sorry! Just a moment
Phone charging		0x1F60F	Took you long enough! / Sorry it took so long
Unlock 4 times		0x1F60B	Zzz… / Sorry! Just checking something
Phone dropped		0x1F613	That was unpleasant / Sorry! I won't do it again
CPU >30% usage	None		No separate screen for this event

4.3 Data logging

In addition to displaying apology prompts, the application also logs data from the phone as a function of time. The data logged are apology-causing events (as listed above), as well as the number of actual apologies made (i.e. whether or not the user actually responded to the application as intended). The logs are saved locally on the phone in the form of text files and are intended for use in evaluating the user's interactions with the phone over time.

5. EVALUATION

5.1 Experiment Design

Our experiment took a two-pronged approach to evaluate the effect of apologies on user-smartphone attachment. The two aspects of the study were:

1. Examining the data logged by the application for a user over time for possible trends (i.e. to see if users would be more careful with their phone as time progressed)
2. Administering a validated questionnaire to evaluate consumer-product attachment before and after the experiment period

The experiment period was 5 days. During this time, participants were asked to keep the application on at all times, restarting it if necessary (e.g. if their phone automatically killed the app).

The pre- and post-experiment questionnaires were administered online. The questions, shown in Table 3, were taken from a survey developed by Schifferstein and Zwartkruis-Pelgrim [10] and scored on a 5-point Likert scale. We discarded questions that were deemed irrelevant or did not make sense in our context, and split the questions roughly evenly in terms of the four aspects of attachment in Schifferstein's model (attachment, irreplaceability, indispensability, self-extension).

Table 3. Pre- and post-experiment questions

Pre-experiment	Post-experiment
I feel emotionally connected to my phone.	I have a bond with my phone.
My phone is very dear to me.	My phone has no special meaning for me. (-)
Even a completely identical phone cannot replace my phone for me.	Another identical phone has the same meaning for me. (-)
	My phone is different for me than other phones of the same type.
Without my phone, my life is fine. (-)	My phone is indispensable for me.
My phone is necessary for me.	I need my phone to live the way I want to live.
If I were describing myself, my phone would likely be something I mention.	If I lost my phone, I would feel like I had lost a little bit of myself.

(**Note:** Questions with a (-) indicator were reverse scored during analysis)

5.2 Participants

A total of 10 participants (5 female, 5 male) completed the study. Participants were Android smartphone users aged 22-28, and ranged in smartphone experience (length of time having owned a smartphone) from 8 months to 6 years.

5.3 Results and Analysis

5.3.1 Data Logs

As expected, there was a wide variation in the number of apology-causing events logged, both day-to-day for each participant and also between the different participants. These differences can be attributed to general variation between participants' routines (e.g. if you are desk-bound all day you may never unplug your phone and let the battery run down), as well as variations in hardware (e.g. the difference in everyday CPU load for a budget smartphone versus a flagship phone). Due to these variations and the relatively short experiment period, no obvious trends in apology-causing events were found.

In contrast, when looking at the number of actual apologies made, every participant clearly interacted with the application less and less as time went on, as shown in Figure 4.
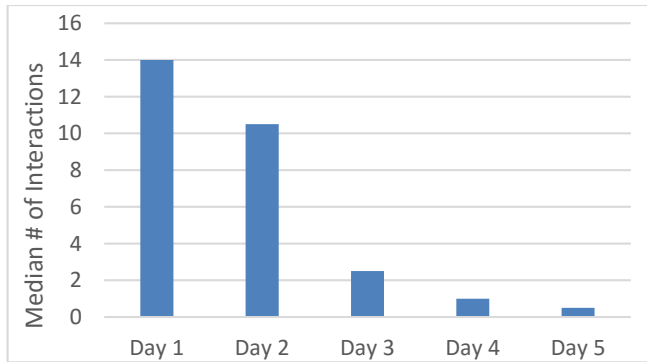

Figure 4. Median number of interactions between app and user

The fact that there was a decrease in apologies without a corresponding decrease in apology-causing events suggests that users learned to ignore the notifications generated by the app, instead of responding by apologizing.

5.3.2 Questionnaire

6 out of 10 participants showed an increase in attachment score between the pre- and post-experiment questionnaires. There was a median attachment increase of 0.625 points across all participants. However, a paired Wilcoxon signed-rank test indicated that this difference was not statistically significant (p=0.0879).
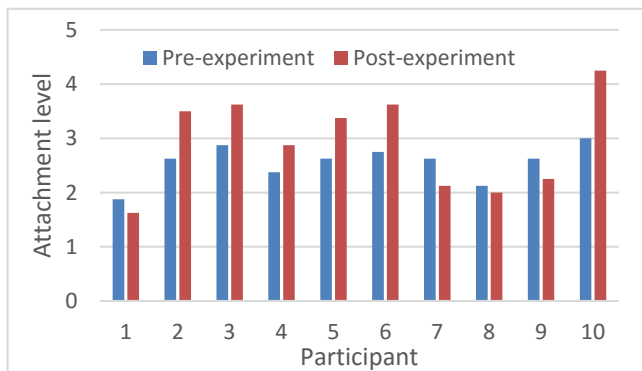
Figure 5. Pre- and post-experiment attachment scores

The result obtained from the logged data (i.e. that participants eventually learned to ignore the notifications) may have affected the validity of the post-experiment questionnaire, since users did not end up making as many apologies as originally intended.

5.3.3 Participant Comments

During and after the study, at least four participants noted that the triggers for phone drops and CPU usage were overly sensitive (the drop message would trigger when the phone was in a participant's pocket, or the CPU message would occur when the phone was idle). This may have been due to variations in phone processors and sensor accuracy. Two participants noticed that the application was causing a significant drain on their battery life, and remarked that it was frustrating to be constantly reminded of the low battery by the application, when those reminders themselves were contributing to the problem.

In general, participants found the constant notifications and prompts "annoying", and reported that the frequency of notifications caused them to learn to ignore the messages (or, in at least two cases, turn notifications off completely). Participants found that

negativity of the prompts (constantly admonishing the user for perceived slights) was "demoralizing", and suggested that more positive reinforcement would have made their experience with the application more pleasant.

6. CONCLUSION

The purpose of our experiment was to evaluate the effect of apologies on user-smartphone attachment. We developed the Pet Phone application to prompt the user to apologize via pop-up notifications. Due to time constraints, we designed the application to output a high number of apology prompts, with the intention of encouraging users to apologize frequently to their phones in a short period of time. Instead, it appears that users simply learned to ignore the high volume of apology prompts.

Responses to the pre- and post-experiment questionnaires indicated an increase in attachment for 6 out of 10 participants, even though users made fewer apologies than expected. This suggests that there is potential in using apologies to enhance user-smartphone attachment, though whether or not an increase in attachment translates to a measurable change in behaviour remains to be seen.

Factors such as previous smartphone experience (i.e. if this is their first smartphone, versus their fifth or sixth), and general predisposition toward anthropomorphism of inanimate objects may be significant when evaluating the interactions between user and smartphone.

6.1 Future Work

This study was limited to the investigation of apologies only, and users were only able to respond according to a single script for each situation. Future work could incorporate additional interaction aspects such as multiple choices for response, or a more extended back-and-forth dialogue.

Further investigation of user-smartphone attachment would benefit from a more realistic experiment situation and longer evaluation period, in order to prevent the user from becoming fatigued and ignoring the application, and also to mitigate to effects of day-to-day variation.

7. ACKNOWLEDGEMENTS

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