The Impact of Social Norms on Users’ Smartphone Notifications Management Strategies

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Abstract

There are paradoxical stories about the role of notifications for smartphone users. On the one hand, notifications can empower us to remain "in the loop" and can help us connect with others through digital platforms. On the other hand, they are criticized for contributing to phone addiction as they pull us away from our immediate surroundings and real life human interaction. This study investigates the tension users feel between these trade-offs. Using Erving Goffman’s model of impression management as a theoretical lens, this study explores how two groups of users, Chinese international students and native U.S. students, manage their smartphone notifications. Additionally, it examines how they negotiate boundaries with technology. Data was collected from semi-structured interviews and participant diary study observations. 14 UNC-Chapel Hill undergraduate and graduate students participated. The findings illuminate what expectations and pressures users consider when reacting to their notifications as well as how they perceive their control in a world of constant connectivity. The findings may contribute suggestions for future smartphone notification design.
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1. Introduction

As recent trends indicate a meteoric adoption of smartphones in the United States, it is worth considering not only what this phenomenon means for individuals’ attachment to their smartphones, but also how this growing pervasiveness will mold social norms regarding availability and receptivity (Smith, 2017).

While smartphone usage in general has been examined in the literature, little research has inspected the role of a function characteristic of the smartphone—notifications (Sohn et al. 2008; Church & Smyth, 2008; Muller et al., 2015; Mehrotra et al., 2017). This study seeks to contribute an understanding of how people make sense of and manage smartphone notifications. In doing so, it will pay attention to how perceived social norms play an intermediary role in that management process. Several sub-research questions have emerged: How do people evaluate a smartphone notification’s importance? What strategies do people adopt in order to regulate smartphone notifications? (Consequently, how do those strategies reflect their priorities?)

Furthermore, this study tries to understand the relationship between the regulations people create and the perceived social expectations to which they choose to reject or conform. How are smartphone notifications shaping and being shaped by social expectations? The regulations will show how the user chooses to promote or inhibit their availability to respond to notifications, as well as how they monitor their attachment to their devices. These choices are important because our attentional capacity is limited, and the time spent using smartphones interferes with our ability to be fully present in our immediate surroundings. Looking at people’s perception of notifications offers insight into their sense of control over their devices and may help us to understand larger patterns of shared expectations in society.

In order to elicit the user’s thoughts and feelings about their interactions with notifications, this study employed a combination of interviews and diary studies. Participant self-reported diaries were chosen over in-the-wild observations because they provide richer, more direct information about the
user’s perception of smartphone notifications. This study also compares the perceived norms of native U.S. students and Chinese international students.
2. Literature Review

This section reviews literature in three key areas, namely studies about the role that smartphone notifications play in people’s dependence on their phones (which can be both positive and negative), studies about how people regulate their own behavior as well as the system settings, and studies that position interaction with notifications within the framework of studies about social norms and smartphone usage.

2.1 THE ROLE SMARTPHONE NOTIFICATIONS PLAY IN THE USER’S DEPENDENCE ON THEIR SMARTPHONES

A notification is a visual cue, auditory signal, or haptic alert generated by an application or service that relays information to a user outside their current focus of attention (Pielot et al., 2014; Sahami Shirazi et al., 2014). The purpose of a notification is to draw the user’s attention from the periphery to the system. In this way, it serves as an invitation to interaction (Elslander & Tanaka, 2013). Notifications come in a variety of forms, such as a pop-up screen, badge, vibration, sound or a combination thereof.

While many features found on smartphones are also available on computers, smartphones have changed where and when people have access to these features (Ames, 2013; Park et al., 2015). Smartphones’ portability contributes to their spatial and temporal mobility (Fischer et al., 2011). Smartphones can be stored in one’s pocket or inhabit the palm of one’s hand, making them easily accessible within a moment’s notice. A study by Dingler & Pielot (2015) found that people respond to phone messages on average within about two minutes of the notification reception. Unlike the typical interaction with traditional desktop computers, people tend to spend brief, fragmented episodes of time on their phones (Oulavirta et al., 2012). Current devices differ from the smartphones of the mid-2000s because of the immense volume and diversity of applications (and consequently notifications) that compete for our attention. A decade and a half of society promoting an aura of omnipotence around these...
devices has altered our expectations regarding availability of ourselves as well as our expectations of others.

The scope of functionality of notifications has widened over the years to include communications-related apps (text message, email, social media), entertainment-related apps (news, games, music), tools and utility-related apps (calendar, alarm clock) and mobile apps related to the system’s internals (system updates). Scheduling notifications like emails, reminders, and calendar invites are crucial tools for organizing one’s time.

The vast majority of alerts that people receive are communications-related, with text messages being the most popular notification type (Sahami Shirazi et al., 2014). Users are typically willing to tolerate some disruption as long as the notification content is considered valuable (Mehrotra et al. 2016; Iqbal & Horvitz, 2010). Some applications offer integrated geolocation-based features or synchronization with social networks, adding an additional layer of personalization. The range of identities that notifications hold complicates people’s models of interaction with them. Ignoring a system update notification has different implications than ignoring a text from a person. Smartphones are a unifying device—our interaction with certain facets of the smartphone do not occur independently of the other components of the device.

Notifications are mechanisms for multitasking, and as a result of our constant access to our smartphones, we expect ourselves to be more productive. They not only enable multi-tasking; they encourage it through the “information rewards” they provide (Oulasvirta et al., 2012). People find the feeling of being kept “up to date” by the novel content from their news feeds or social networking applications stimulating. In this way, notifications have trained us to self-interrupt through instant gratification. Although users may perceive notifications as a form of passive awareness, in reality they act as a “gateway” for prompting them to spend more time on applications (Iqbal & Horvitz, 2010; Oulasvirta et al., 2012). Fast-paced multitasking has been recognized as a prevalent pattern among knowledge workers (Iqbal & Horvitz, 2010). The opportunity for constant connectivity that these devices facilitate
carries both benefits and costs. Although we perceive that we are more productive, multitasking undeniably puts a strain on our attentional system.

The change in size of computing devices, coupled with their increased computing power and functionality, has contributed to a more intimate relationship between people and their phones. This relationship is manifested in the habits people have developed. Sometimes users reach for their phones because they subconsciously perceive a vibration, a phenomenon known as phantom vibrations (Drouin et al., 2012). Studies have shown that people feel anxious when they do not have access to their phones (Trub & Barbot, 2016; Elslander & Tanaka, 2013; Mehrotra et al., 2016). Researchers have begun to label this pattern of hyper-attentiveness as shifting away from mere habit or annoyance but gravitating towards addiction (Dingler & Pielot, 2015; Kuschlev, 2015). The paradox of the smartphone is that it is designed to make us feel more connected—more in control—and yet many people feel more dependent on them than ever before.

2.2 CONSCIOUS RESPONSE TO DEPENDENCE: REGULATION OF THE USER’S OWN BEHAVIOR & OF THE SYSTEM

A significant number of studies have analyzed how the interruptive nature of notifications affects human behavior, especially humans’ efficiency of task completion. Adamczyk & Bailey (2004) observed the effects of interruption on task execution. Fischer et al. (2011) investigated how the timing of an interruption during an episode of phone interaction, in this case, voice or text messaging, influences the user’s receptivity of the notification. A common thread among this research is the identification of breakpoints. People are more interruptible when they transition between the last stage (evaluation) and the formation of a new goal or intention (Okoshi et al., 2016). It is difficult for people to return to their previous activity after the interruption (Dingler & Pielot, 2015). Park et al. (2017) transfers the concept of breakpoints to study notifications during interactions in social settings.
Mehrotra et al. (2016) build on this work to illustrate that the response to notifications is more nuanced than simply the timing of the interruption; task type, complexity, alert modality, and the sender-receiver relationship also play a role. Furthermore, other research has shown that the user’s perception of an interruption depends on individual factors such as the user activity, cognitive load, ongoing task, emotional state, social engagement, personality or relational context with the sender (Turner et al., 2015; Grandhi & Jones, 2010; Ho & Intille, 2005). Researchers are beginning to pay attention to internal dimensions like the emotional response to notifications. With information about user behavior collected through surveys and a series of in-situ experiments, Yoon et al. (2014) developed three main categories for stresses caused by notifications: physical notification stress (caused by inappropriate notifications in a specific situation or a series of notifications), message content stress (caused by anxiety of missing valuable information or unimportant messages), and responsiveness stress (caused by the pressure of responding in real-time or waiting for a delayed response). This study diverges from the work of Yoon et al. (2014) in that it does not view the reactions to smartphone notifications as inherently negative. Rather, it is the tension between the positive and negative feelings towards the notifications that makes our relationship with our smartphones so interesting.

Besides the issues of interruption and emotional response, a core underlying problem is the inability to intuitively assess notifications’ importance. It should be noted that some notifications are more predictable than others. Users may expect a text message or a scheduled calendar alert. Nonetheless, in the seconds following the successfully perceived chime, vibration, banner, or lit-screen, users must decipher whether the notification is important enough to respond to in that moment. Their judgment is based on the notification’s meta-data content, content relevance to the situation, content action ability, content urgency, the user’s relationship with the sender, and the mode of alert (Mehrotra et al., 2016; Fischer, 2010).

The user’s negotiated response is more complex than simply to engage or ignore. After the interruption event occurs, the user must choose if they want to shift their focus to the notification. The
series of conditional steps continues: if they choose to react, they then must check their phone screen to identify the notifying application. After reading the displayed meta-data in the banner, the user may decide to open the notifying application to read more content (some notifications content can be read in full in the notification center). For certain notifications, the user may decide to act on the content (for example, reply to the email) (Turner et al., 2015; Gallud & Tesoriero, 2015). The user may also elect to open the corresponding application on a more appropriate device (Dingler & Pielot, 2015). These processes are all ways through which people modify their response to notifications, showing that responses are usually thoughtfully executed. There still needs to be more research done on how people decide if, when, and how to react to smartphone notifications.

The notification management decision-making process is not restricted to the moments following the interruption. People adapt the system to fit their needs. They may have a default setting that turns their notifications on silent for portions of the day. They may put their phone on vibrate mode while they are in class or in a meeting. They may disable only certain parts of application notifications. People incorporate their own idiosyncrasies in their strategies. There is a current gap in the literature in our understanding of why people set these boundaries.

2.3 THE IMPACT OF SOCIAL NORMS ON RESPONSE TO SMARTPHONE NOTIFICATIONS

Most of the literature to date has focused on the individual’s response to smartphone notifications in isolation, ignoring the interference of social dynamics in the equation. Social norms are implicit beliefs about what is acceptable or unacceptable in particular contexts. This study is grounded in Erving Goffman’s impression management theory from his seminal book, *The Presentation of Self in Everyday Life* (1959). Impression management is the process in which an individual attempt to control what impression he or she gives off in an interaction. The cues gathered from the individual’s conduct or appearance are what Goffman describes as “sign vehicles” for conveying information.
Goffman uses the metaphor of a theatrical performance to describe how people interact in different social contexts. The “front stage” is how one acts around other people, whereas the “back stage” is the private space. It represents how one acts when they by themselves or with close friends or family. Goffman argues that there are many stages that require many scripts. This study seeks to understand how smartphone users put on different “performances” (patterns of behavior/receptivity/connectivity) in their established roles for various audiences, i.e. family, work, school, friends. Furthermore, it compares how smartphone users’ form both digital and real-world impressions: they establish their identity through computer-mediated communication and through face-to-face interaction.

Communication through smartphone notifications in many ways is governed by social expectations. There is an expectation that because people have easy access to communication channels, they should be more responsive (Ames, 2013). Studies have shown that the social pressure to respond is a motivating factor for texting (Pielot et al., 2014; Park et al., 2017). In communications sent via text messaging, the sender is not guaranteed clues of the audience reaction through an immediate response or facial responses. When there is no response from the receiver, the sender is left to assume their intentions. However, unlike real-life conversations, conversations through text messaging are not ephemeral. Past texts record a trail of the interaction. Text message timestamps or the read receipts are just some facets of the documentation. Thus, violations of expectations are made more salient.

The user’s perception of social norms is linked to their environment and situation. Organizational culture and interpreted meaning of place (for instance, the library being labeled as “productive”) influence how people judge the appropriateness of responding to notifications (Mehrotra et al., 2017; Fischer, 2010). In the era of ubiquitous smartphones, Americans claim that they perceive them as distracting and annoying in social settings, yet in contradiction they continue to use their phones around others (Rainie & Zickuhr, 2015). When people send notifications in social settings, their attention oscillates between the people in their presence and the people they are communicating with through their smartphone (Benediktsson et al., 2015). Ames (2013) shows that notifications create two competing desires: to be
available and responsive and to be present in one’s immediate surroundings. One of the aims of this study was to gain insight about what factors tip that scale.

In a study about knowledge workers’ use of email devices, Mazmanian et al. (2013) discovered an “autonomy paradox”. While the portability of the device and the asynchronous nature of email gave users a sense of control by allowing them to efficiently and conveniently monitor information delivery and receipt, this sense of control was belied by their compulsion to check their devices. The compulsion was attributed to organizational norms of continual accessibility. The smartphone creates “permeable boundaries” between the digital and present, but those boundaries are impacted by the user’s adopted social or organizational roles (Derks and Bakker, 2014).

Norms are not stagnant, nor are they universal. The various levels of expectations along with the knowledge asymmetries between sender and receiver need to be accounted for when analyzing notification response behavior. Nevertheless, there is often uncertainty as to what actions users perceive as violations. Yoon et al. (2015) point out that there is a lack of research that explores the cultural differences in smartphone notification perception.

In summary, there is a gap in the research of not only how people’s interpretation of social norms impacts their interaction with smartphone notifications, but also how they learn to apply or resist the norms over time. Social expectations affect how we evaluate a notification’s importance, as well as how we regulate the system and our own behavior.

This study was inspired by the work of Dr. Melissa Mazmanian and her colleagues. It is an extension of “The autonomy paradox: The implications of mobile email devices for knowledge professionals” and “Crackberrys: Exploring the Social Implications of Ubiquitous Email Devices”, but it differs in its focus on digital natives’ smartphone behavior, its emphasis on the notifications aspect of smartphones, and its sensitivity to the cultural influences on perception of norms.
3. **Methodology**

This study consisted of a combination of semi-structured interviews and diary studies. Every participant was interviewed about their smartphone notification management strategies and perception of social norms. A small group of participants also completed diary study observations where they recorded their reactions to smartphone notifications.

3.1 **SAMPLE**

A total of 14 undergraduate and graduate students from the University of North Carolina at Chapel Hill participated. Four of the 14 participants elected to do both the diary study and the interview. An additional four students were interviewed as pilot participants. All of the participants were affiliated with the School of Information Library and Science (SILS): they were pursuing either a minor, major, master or doctorate degree in Information Science. Participants were screened based on their student status, smartphone ownership, and their age. The rationale behind the age range of 18 to 26 is because these users are digital natives. Most users in this demographic got their first smartphone in high school and their first traditional phone (a phone that does not have internet capabilities) at an even earlier age. Because of this history, they may hold different expectations of the technology and of communication patterns. During the interviews, the majority of participants responded that they were in high school or just starting their college career when they received their first smartphone. When these participants entered college, owning a smartphone was the standard.

Additionally, Chinese international students, who composed half of the sample group (seven of the 14 participants), were of interest for two reasons. It was hypothesized that their cultural background may influence how they interpret the appropriateness of smartphone notification response. Secondly, social norms may dictate what type of applications are popular in another country.
A study recruitment email was sent through the School of Library Information Science (SILS) students listserv in January 2018. In order to recruit international students, the study investigator posted a study blurb in the SILS Chinese international students’ WeChat group. Participants were also recruited via purposive snowball sampling. Successfully recruited participants were asked to provide references of potential participants who fit the outlined criteria.

As compensation for their time, participants who completed the diary studies and the interview received a $20 Starbucks gift card. Participants who completed the interview received a $10 Starbucks gift card. The SILS Carnegie grant funded participant payment for this project.

3.2 STUDY SETTING

The interviews were conducted in reserved reading rooms in the Undergraduate Library and Davis Library at the University of North Carolina-Chapel Hill. These locations were chosen to reduce distraction and to protect the privacy of the participant. Participants who did the diary studies component were able to fill out surveys at whatever time or location was convenient for them, as long as they finished the surveys within one week.

3.3 DATA COLLECTION

- Group A: pre-session interview + diary studies + comprehensive interview
- Group B: comprehensive interview

Group A, participants who chose to do the diary studies portion, met for an informational interview with the study investigator to prepare them for the diary studies. The investigator explained the purpose of the study and gave them the consent form to read and sign before any data was to be collected. The expectations of the researcher, as well as the expectations on their end, were outlined. Participants were given directions about what to include in the diary studies, i.e., frequency of reporting, type of survey questions, screenshots.
The day of the initial meeting, an email with the survey link was sent to participants. Participants were asked to record their retrospective observations of their notification reaction behavior at a minimum of 10 times over the subsequent seven days. The rationale behind the diary studies portion is that they enhance the participants’ ability to provide more detailed evidence about their social context and reaction behavior. It is most useful for capturing information about the user’s thoughts and feelings and revealing patterns in behavior. Participants were also given the option on the survey to upload an image of their notification or of their environment. In-situ retrospectives give a glimpse of more realistic behavior than if the study was conducted in an artificial lab environment. However, the format is less intrusive than direct observation. There are limitations to diary studies, though. Since it is self-reported information, participants are biased in the selection of events they choose to record and how they describe them.

Following the diary study period, participants underwent a post-session comprehensive interview. In this stage, participants were asked to reflect on their experience over the previous week. The interview was semi-structured; the observations from the diary study served as starting points for probing questions. They were occasionally asked to clarify their notes or give specific details. The diary observations were compiled into a single document which was made available to both the participant and the study investigator during the comprehensive interview. The participants were asked but not required to give examples of how notifications appeared on their phone or for which notifications they have customized settings.

Participants were asked to not only reflect on their own behavior, but were also asked to share their perception of the appropriateness of others’ behavior.

The interview protocol for Group B was similar to that of Group A. All transcribing and privacy procedures remained the same.

Data was captured on the Qualtrics online survey tool. The survey asked closed questions about the category of the smartphone notification or the perceived level of distraction that it caused.
Additionally, the survey asked participants to provide brief answers about the social and environmental context in which they received the smartphone notification. Many questions were linked to other questions in the survey. For example, participants were asked about how they reacted on a smartphone notification, why they reacted in that way, and how they felt during that notification episode. An open input box allowed participants to elaborate on any part of the episode.

Both sets of interviews were audio recorded and transcribed. Participants were assigned an identification code to protect their privacy. Absolutely no names were to be included in the results report. Collected interview data was to be deleted before May 12, 2018.

3.4 DATA ANALYSIS

The transcripts from the pre-session and comprehensive interviews were coded for emergent themes based on participants’ notification management strategies and their perceptions of social pressures. For example, smartphone notification management could be related to ‘privacy’, ‘organization obligations’, or ‘segmentation of time.’ Frequent keywords were extracted and categorized. For example, ‘stress’, ‘comforting’, or ‘information overload.’ Other anticipated themes included the user’s sense of control, perceived utility of notification, and habitual behavior. Each of the interview and diary study questions were linked to at least one of the research questions they intended to answer.
4. Findings

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**Research Questions:** How do people make sense of and manage smartphone notifications? What role do social norms play in that process? How do people evaluate a smartphone notification’s importance? What strategies do people adopt in order to regulate smartphone notifications? *How are smartphone notifications shaping and being shaped by social expectations?*

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THE ROLE SMARTPHONE NOTIFICATIONS PLAY IN THE USER’S DEPENDENCE ON THEIR SMARTPHONES

- 4.1 Boredom, Micro-escapes, and Habit Formation

CONSCIOUS RESPONSE TO DEPENDENCE: REGULATION OF THE USER’S OWN BEHAVIOR & OF THE SYSTEM

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THE IMPACT OF SOCIAL NORMS ON RESPONSE TO SMARTPHONE NOTIFICATIONS

- 4.4 WeChat, Cultural Norms and Smartphone Notification Organization
4.1 Boredom, Micro-escapes, and Habit Formation

This section analyzes **user smartphone checking habits**. It looks at the environments and emotions that trigger those habits. Notifications act as the “cue” in the habit cycle of cue—behavior—reward. It is necessary to contemplate the causes and the consequences of smartphone checking behaviors and how they may be linked to phone attachment.

Across the board, participants recognized that the first thing they did in the morning after waking up and the last thing they did before going to sleep was check their phone. The alarm clock functionality only strengthened that reliance. A few participants saw the ritual as a method of self-maintenance; the visual clutter of notifications was equated with mental clutter of a looming to-do list. Tending to or deleting the notifications was equivalent to “cleansing the pallet.”

In a diary entry, P6 described how after she had just woken up, she opened a Snapchat notification. She said that it was difficult to label an emotional response because she did it “mindlessly.” Her episode showed how there are some habits in which we are so conditioned that we are not even aware of our behavior.

The second most common time participants checked their phones for notifications was when two conditions were met: one, they were bored and two, they were alone (e.g. P2, P3, P4, P9, P10, P11, P14). That could mean anything from watching TV, waiting on the bus, or using the restroom. The diary entries showed that participants were generally happy to receive notifications during perceived down time. They rated them as a low to moderate level of distraction when they were bored at a long day at work (P6) or eating lunch in the dining hall (P7). P4 reasoned that her ritual for checking in the bathroom during breaks at work was a way to multitask, “to kill two birds with one stone” but was also a chance for “me time.” She welcomed the plethora of distractions offered by her phone. The desire to make use of down time reinforced the norm of constant connectivity.
P9 said that she would most often check her phone in times she labeled as “hurry up and wait.” That was usually when she was at the place she needed to be, but the event/meeting/class had not begun yet. This episode demonstrates the concept of breakpoints, i.e. people are more receptive to interruptions during periods of transition between two activities. A couple of participants’ rationale for checking their phones when they were eating by themselves was to avoid embarrassment (e.g. P10, P14). It is worth questioning why eating alone causes embarrassment. What did people in the pre-phone era do when there were no books in the cafeteria? It is strange that society has formed a norm where users feel like they need to make a performance of being constantly occupied. How do the social cues from the performances affect how others perceive their availability for social interaction? The phone creates boundaries for social interaction.

Unlike most participants who said they tried to limit their receptivity to their notifications when they were doing homework, P12 admitted that he was actually most receptive when he is in is dorm doing homework because it was “good to take a break.” Lukoff et al. (2018) label this behavior as seeking “micro-escapes” through the phone. Micro-escapes occur when users do not have an intended purpose to achieve on their phone besides the desire for relief from negative emotions like stress.

A couple people used the word “comforting” when they described their phone checking behavior (P6, P12). “When I am bored, it is comforting to have. When you have nothing useful” (P12).

Similarly, P11 commented “I feel bored when there is not stuff showing up on my phone…If I am just relaxing, I like to receive notifications and forget all the pressure. It shows me some exciting things to do and I just need that.”

Don’t underestimate the power of information rewards, the “exciting things.” The term ‘information rewards’ was popularized by Oulavitra et al. (2012) in a study on phone checking habits. We are drawn to notifications because of the anticipation they create—will the notification be satisfying (a message from a loved one or an interesting article) or will it be less-than-satisfying (a software update)?
Human beings are naturally curious. If the information pushed to us is not deemed rewarding, we take the opportunity to find rewarding information. Once we are inside the app, the scrolling behavior further cements our conditioned habitual checking. It is like playing a scratch off ticket for the lottery. Keep playing, keep scrolling, and you are bound to find interesting content buried somewhere. The search and discovery behavior is stimulating in itself.

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There is something about the tangibility of the smartphone and the gestures it invites that make it comforting. P9 said that sometimes she will flick through the menu just to do something with her hands, even though she is not necessarily looking at the screen. In oddly specific shared scenarios, two other participants said that when they were without their smartphone, they would sometimes fiddle with their calculator (P4, P7). P2 said, “When I am bored, I will tap my phone”. The tangibility contributes to the habit formation because the checking habit stimulates multiple senses.

P14 said that he observed a lot of people who would just aimlessly swipe their phone screen when they were alone. He said, "It seems if you are in some situations where you feel a little bit more embarrassed, you will unlock your phone and just swipe over and over again and actually don't do anything but just slide and lock and unlock again [laughs] and just play with the phone for some purpose."

The difference between a technology like the smartphone and a technology like the book is that the smartphone generates rewarding haptic feedback. All of that pushing and swiping manipulates the technology. It responds by changing form and changing what is presented on the screen. If you attempt to push or swipe at a book, one can almost guarantee that it will not magically change form besides a turned page. That makes it so alluring to interact with, even if the user is in a conversation with a human. Moreover, it consistently refreshes its content (and does not shy from reminding you that through the notifications).
It is a strange paradox. Notifications are notorious for interrupting us regardless of our current situation. They can be perceived as distracting for pulling us away from our immediate surroundings. Yet when we are bored, we often seek comfort in the digital spaces that we have designed. Our attachment to our smartphones is related to our desire to set boundaries and to enable availability. The smartphone facilitates comfort through its form (a small companion device) and it function (delivering interesting and useful information.)

4.2 Setting Boundaries

4.2.1 Regulating Smartphone Notifications

This section looks at how users set boundaries with their smartphone to control their connectivity. In addition, it looks at how users enable their availability through the notifications function. Acting as the “gateway” to the smartphone, notifications are the first line of defense. Users can manipulate the form and timing of notifications in the smartphone settings.

One aim of this study was to understand how users develop long-term strategies for managing smartphone notifications. For the purposes of this paper, “managing” is defined as the in-the-moment reaction to a notification. “Strategy” is the longer-term, premeditated, proactive plans users have in place to deal with notifications that arrive when the users are in a certain environment, at a certain time of day, or from certain groups of people. This is where the theme of regulation comes into play.

The user can create boundaries, or constraints of use, in a physical and a virtual sense. Participants discussed how they would hide certain facets of the phone’s ability to notify them. For example, as a physical barrier, participants would put the phone in their pocket where they could sense the vibration, acknowledge the incoming notification, but not be tempted by the message content from the notification banner. In times of desired productivity, some participants would put physical distance between themselves and their phones. Some would place the phone on the opposite side of the room or
into a power outlet (P4, P8, P9). A couple users said that they had attempted in the past to physically remove themselves from their phone, but that it never lasted long.

When asked how the social situation—if they were alone or in a group—affect their phone-use habits, most participants replied that if they were in the company of friends or family, they would try to limit heavily interacting with their phones, especially during lunch or dinner. Some said they would acknowledge a notification if they perceived it, but would usually not go the next step to open the app, read, or respond. (Note: these are reports from interviews, not real life observations, so it is impossible to verify if users truly act this way in real life.) Mealtime norms were learned when they were growing up. A couple of participants admitted being indoctrinated by their parents in the norms of using technology (or not) at the table (sometimes through their parents scolding them) (e.g. P3, P4, P10). We have to consider how smartphone use behavior is both rewarded and punished. Future research should explore mealtime norms and technology use.

One strategy of the participants was to flip their phones face down when they were conversing with other people, be it friends, professors, or colleagues (e.g. P2, P5). When asked to explain why they did that, they said their motivation was to signal to the other people in the conversation that they prioritized face-to-face interaction at that moment. Interestingly, quite a few participants turned their phones face-down during the interviews.

Other participants believed it was appropriate to check and respond to smartphone notifications when they were conversing with others as long as they were not “on their phones” (P4, P7). That requires a degree of restraint, though. When asked what being “on” the phone looked like, they gave examples of being bothered when the person that they were speaking to was in a lengthy texting conversation or playing a game.

In a virtual sense, participants often took advantage of the “Do Not Disturb” feature, especially at night. One participant used the Do Not Disturb feature as a layered filter system. Only her family
members and boyfriend could pass through that filter. If she received a message, she would automatically recognize its importance (P1). If she received a phone call from those people, she would assume it was of even greater importance. The “medium” of the notification (phone call or test) contributed to the perceived value of the message.

This functionality’s purpose was complicated for the international students, though. Because of the time zone difference in China, participants would sometimes receive notifications from their family in the middle of the night. Some of those participants still welcomed those notifications and planned their schedule around them. Others found the interruptions annoying and tried to avoid them. Norms of constant connectivity are muddied when the sender and receiver are not on the same schedule.

P11 expressed her frustration with the notification timing in her diary. “It's a short essay from a dictionary app, named Youdao. Sometimes the app has really interesting stories to share. But how great the essay is, it will annoy me if it's sent at 2am. I guess this app also hasn't overcome the jet lag. The buzzes woke me up and dragged me out of my beautiful dream. I guess it's better for me to disable the notification.”

Reflecting on another notification episode in her diary, she said, “It is a recommended songs list for Valentine's Day from a music app, named XIAMI. I was sleeping when the phone rang in the morning--The app still worked under Chinese time zone. I just ignored it. Maybe I will have a try about the songs recommended this evening” (P11). She rated both episodes as highly distracting.

4.2.2 Message Content

Notifications are essentially vessels of content that hold a range of identities. They “wear many hats” -- from liaison that helps us connect with others in our social networks to personal digital assistant that provides us reminders to complete tasks on time. This complexity makes setting boundaries with our technology tricky. Notifications are really messengers; they would not exist without the underlying content that had prompted them.
P8 lamented that what she did not like about her phone was that “it has too many distracting things. There is always fresh news, interesting things, friends’ messages, sometimes about [your] advisor and you have to open it.”

The interviews revealed that part of users’ anxieties related to smartphone notification management was derived from the uncertainty of the content of the notification. There are notifications that we expect to receive at certain times: we can sign up to receive daily news notifications or a we can agree to be signaled by a nearby store or we can set our reminder to remind as at an exact minute in time. We have less control over when we will receive other notifications, especially those from people; we do not know when to expect them or what they will contain.

P12 talked about how whenever he sent a risky message and did not know if the anticipated response would be good or bad, he would turn off notifications on his phone. He did this so that he could check the message when he was mentally prepared. He likened his behavior to the theory of Schrödinger’s Cat. The theory goes that as long as the state of the cat unknown, it is simultaneously dead and alive. Once you open the box, the cat either dies or lives. As a dark analogy of interpreting the uncertainty of notifications, the user experiences freedom until they choose to check the notification. This concept falls under the “message content stress” of Yoon et al.’s (2014) taxonomy of notifications.

P9 had a similar experience when she was in dispute with a friend. “I don’t want to even see what she says because it will make me upset” (P9). She decided that she must choose between blocking, deleting, and muting communication from that contact.

The phone lock screen is like the doormat to a house. The notifications are the boxes that sometimes contain the metadata or previews of the content (like the sender address). The alert is oftentimes enough to spark the user’s curiosity, making it difficult for them to resist opening it. The adage goes “don’t shoot the messenger.” In this case, users bar the messenger from even entering their realm of attention. Uncertainty of the content was a major source of users’ anxieties.
The desire for privacy was another aspect of users’ smartphone notification management strategies. Acting as the “front door”, the lock screen makes notifications visible to outsiders. P8 said that she often changed her notifications settings. If she was around other people, she only wanted the message type, not the content of the notification, especially from social apps like WeChat to be displayed on the screen. She did not want to reveal too much on her phone because she did not want people judging who she followed or the “gossip” in conversations.

Another participant said she was embarrassed when her friends saw game notifications appeared on her screen (P11). P4 said that she did not want dating app notifications to appear on her lock screen. Unlike most other participants, though, P4 opted to receive email notifications on the lock screen but not text messaging notifications. She said, “Email is ‘an open book.’ ‘I have nothing to hide… but conversations with friends over text for me are the most personal ones that I have on my phone and so I would like because I leave my phone out I don't want people reading my stuff. Whereas email is like oh LinkedIn. ‘Hire me.’ I want everyone to see that.” [Laughs].

Different categories of notifications mean different things to people. They reveal what kinds of things people find are worth being interrupted for. Fitting into Goffman’s theory, users strive to fashion themselves appropriately on their “front stage”. (In this case, the audience is the people who can see the phone’s lock screen.)

4.3 Regulating One’s Own Behavior

4.3.1 Enabling Availability: Synchronicity on Social Platforms

Users were also motivated to increase their availability. As promised, paper analyzes the negative and the positive aspects of notifications and constant connectivity. Participants liked how social media notifications let them know when someone else was on the same platform at the same time as them. It formed a digital connection that transcended physical space.
P4 said, “Say I post picture and then like a minute later someone likes it for me that like I think that's cool because it shows that she or he is also whoever is on their phone at the same time using Instagram.”

P5, P6 and P11 all had similar experiences. They liked being notified when someone liked their photos on Instagram or Facebook. It showed that their presence on the platform was synchronized, thus it built a sense of community through their shared behavior. In a diary entry, P7 described how she was immediately notified when someone answered her question on the social platform, Discord.

The synchronized communication enabled by notifications was vital for when friend or school groups tried to coordinate meeting times, for example they wanted to get dinner together (P5, P7, P9). In these scenarios, participants had greater expectations for receiving notifications so they were especially alert. The real world experiences created would not have been possible without the computer mediated communication. They were motivated to enable their availability for the sake of coordinating a time and place to interact in real life.

Some international participants wanted to keep in touch with the global community. P8 valued notifications from news organizations like BBC and CNN. P10 appreciated how the social media apps not only helped her keep in touch with friends, but they also helped her stay up to date on world news. For her, reading news from China and the U.S. was important because the immigration policy is so unstable. She can avoid the hassle of having to go into the app to search for the news. The relevant news comes to her.

P7 noticed that she tended to be more receptive to interruptions in certain social contexts. “If I am in my room, I don’t want to be bothered. If I am physically social, it is easier for me to be online social.”

Another participant had an altruistic view of notifications and constant connectivity. P12 felt that they made him more accessible to people in his social network. He gave the example of the morning before the interview, a friend texted the friend group requesting an extra person to participate in a focus
group. He readily signed up and participated. The notifications help make him aware of others’ lives so that he can contribute to them. He repeatedly used the word “contribute” to describe his behavior. His connectivity connected tied him to a large group and a larger purpose.

It was feeling of synchronicity in all of these instances that contributed to a sense of community. Whether it is engaging in the same social media with a friend or feeling like you are engaged in world current events or relying on the synchronicity to plan in-person meetings, participants’ stories showed how notifications’ call to interaction were welcomed.

4.3.2 Regulating One’s Own Behavior: Communication Rhythm

One of the ways in which participants managed “impressions” of themselves through their smartphone notifications was by signaling to the people in their social networks their connectivity (or lack thereof.) College is a volatile time of networking. Social bonds are formed and dissolved rapidly. Communicating via smartphone is a key activity to build and maintain connections. Participants said they tried to be responsive when they expected their friend group was planning an activity, such as coordinating a meeting time and location for lunch (e.g. P9, P12, P14). P5 said that she felt like she could make up for not being physically present by demonstrating that she was “being there” for them (her friends) in her digital sphere.

P1 said that when she received a notification, she felt like she was being “sought after”, so therefore it was important to her to answer right away. The presence of notifications can produce contradictory emotions. P7 said that although a wave of notifications can make her feel overwhelmed, when she does not feel the vibrate of any notifications, she feels sad. These findings show how notifications facilitate group events and thus community, and they also build self-esteem.

P13 said that if she saw a message, she wanted to immediately respond to it. P5, one of the participants who did the diary study, reported that she would respond to notifications immediately whenever, wherever. She did this because she said she would feel guilty if she did not respond because
she knows what it is like to be the person on the other, ‘sender’, end. Participants did not want to cause
the sender stress or confusion (e.g. P5, P14). Plus, they did not want to forget to respond (e.g. P1, P5,
P14).

Not everyone was so keen on the norms of receptivity. P9 meticulously controlled her timing of
communication. Her SMS and Facebook messenger notifications were turned off for most of the day
because she did not like feeling like she was “on call.” Most other notifications were put on mute so she
could check at her own pace.

She said, “I am the one who gets to decide when to reply… I set it so the most important things
come to me. All the other things I go to them… I make sure I am only communicating with people when I
need to communicate with them or when I have the proper time to communicate with them. I reply to you
when it is convenient to me.”

She continued, “I used to be religious about checking my messages. When that was the case, I
realized no one really has the right to do that. I have specific times when I am checking and available and
if I happen to be on later and message you you’re lucky. And I make it very clear--I don't check
notifications all the time. I am not going to respond to you right away unless I happen to already be online
for another purpose. Carving out a margin where I am not receptive is exceptionally important to me
lately in part because I feel like other people have a bigger say in my life than they need to have when
they can contact me all the time and also because it feels like my brain never gets a rest if I'm checking
my notifications all the time” (P9). It begs the question: to what extent are notifications, smartphones,
technology really enabling convenience if our minds never get a chance to rest and be mindful?

P5 said that her pace of communication changed when she switched from a flip phone to a smart
phone. Her family used to have a pre-paid phone plan that limited the number of texts she could send each
month. Back then, she spent more time writing the content of notifications and she took more time
processing notifications as they came in. Each notification was perceived as more valuable because it
literally cost more. She gave her phone attention, but it was a different kind of attention—more deliberate and planned.

4.3.3 Expectations from Group Association: Social Pressure

Some participants implied the pressures related to notification receptivity were rooted in group association.

P1 felt that her expectation to be constantly connected came from her membership in a campus organization. “So I see a Gmail email and I know it’s for the [organization] account and I need to respond to that quicker because that's me as an organization versus me as an individual.”

In the context Goffman’s impression management theory, her receptivity to her notifications was how she established the “face” for that organization; it was part of her duty to her group to demonstrate receptivity. Belonging to an organization implies implicit duties responsibilities. You owe it to the organization to be responsive because people are dependent on you. In *The Presentation of Self*, a team is defined as grouping in relation to an interaction or a series of interactions in which the relevant definition of the situation is maintained. The interaction is an inherent part of the identity of the organization.

P2 described how it was hard to set boundaries of connectivity at her job in China because her organization used the messaging function on WeChat to communicate work-related information. That organization required traveling, which made access to the smartphone even more critical.

When P11 was working in China, her boss intentionally communicated with her through text message because he knew that she would not check email as frequently. She said, “I don't want my boss with me. Sometimes I feel like they always have an eye on me and it makes me feel uncomfortable because I want my own time. When I have the time to report to him I will report, but I don’t want him to ask me all the time.” Similarly, when P7 interned at a large tech company, she was offered the chance to exchange her private phone number with other employees. She declined because she felt that would be an invasion of privacy and that it would have forced her to communicate after work hours.
Participants liked the societal norm of treating email as asynchronous communication (e.g. P7, P9). Email invited more time for development of thought, which participants perceived to be especially important for work-related matters. Users could acknowledge an email, let it ruminate in their mind, and then compose a response.

The ‘discovery’ and ‘novel’ part of notifications was especially important for participants when they recognized that other people had access to that information, trend, game, etc. P7 felt conflicted because although she hated the experience of receiving the notifications, she valued the ability to stay up to date with trending videos. “I hate YouTube notifications. I absolutely hate them. I don't know why I don't turn them off. Maybe that is a social norm. I don't want to miss out on something everybody else might be watching. I signed up for this channel and for the notifications and I still hate this.”

P4 associated HQ Trivia game notifications with the psychological concept of “FOMO”, an acronym for the “fear of missing out.” “I get the notification, you know, ‘It's time. Login.’ I'm in class. I should turn off the notification, but I don't and you know it's like my phone is right there and I'm in class and it just pops up and I can't so I guess that's kind of like a FOMO because I know that a lot of other people can be doing it. I'm like, ‘I want to do it.’”

Participants also relied on notifications to inform them when items went on sale. One had notifications for Facebook’s “Free and For Sale” social group. An additional participant received Craig’s list updates. Two others had eBay updates to let them know if someone bid on an item. Enabling their availability was key for gaining an advantage in the market. They knew the longer that they waited to go to the app, the higher the likelihood that others would see or have access to the product that was on sale.

P5 especially liked how the social media apps kept her in the loop. “Once I got my smartphone, I instantly downloaded Facebook messenger, Instagram, all of that and I started posting immediately. Like I thought I was a model so I would go outside and take pictures and post all of these things just tried to feel like I had to catch up with the rest of the people and so every time I got a ‘like’ or every time a
notification appeared or someone sends me a message I always felt really excited. I always wanted to talk to people. I got to do all of these things and see what they were up to.” Participants purposefully enabled their availability to their device so that they could be informed about news, events in their communities, or happenings in their friends’ lives.

4.3.4 Read Receipts: Technological Pressure

Whereas the previous section outlined the ways that pressures originate from people/society, this section explores pressures that originate from the design of the technology.

The read receipts function was highly controversial. Even though many texting applications on phones allow users to configure the settings, some platforms like Facebook Messenger do not. There are differently levels of visibility. Timestamps show what time the message was seen. The message ellipses indicates when another person is typing, implying that they have read the message. Read receipts fall under Yoon et al. (2014)’s “responsive-ness stress” category. It is the expectation to respond at a certain time or at a certain pace that shapes the user’s behavior.

P1 strongly advocated for them, saying, “You can always use the information to your advantage. I think that that's a feature that we have and we should utilize and people who don't use it I feel like why do you feel a need to withhold that information from me? I don't feel the need to withhold that information from them. If I see I’ve read their text messages, I just won't open it.” P1 argument was based on expected reciprocity between the sender and receiver.

She continued, “I am one of those people who will respond as soon as I can about anything even if you are saying just, ‘Hey how’s your day?’ Because I had a friend who was I guess we kind of had a thing and I found out afterwards he was like, ‘I didn't want to text you too much too soon because I thought you’d think I was too needy or too desperate to talk to you.’ And I'm like, ‘the point of messaging and notifications is like we can talk as quickly and efficiently as possible and I don't understand why you would let that notification sit there and wait so that I thought you were doing things and had a life outside
of texting. You know I think that’s silly. I will always respond to notification as soon as possible I don't feel guilty for that.” Reflecting on Goffman’s impression management theory, the friend was putting on a performance by trying not to appear needy or seem like he did not have a life. He was using the pace of communication to form that impression.

P12 held a somewhat similar view. “Read receipts are good for accountability. I have them on. I can understand why people don’t have them on, but I like to have read receipts on. It keeps me grounded.”

P9 was strongly against read receipts. “People will read things and need time to compose their thoughts. If you do not respond immediately, that is considered offensive. Read receipts is a bad invention because it essentially enables social pressure. I really don’t see it ever having helped my life” (P9).

P10 did not use read receipts because of its effects on the sender. “I don’t like the read receipts. If someone reads my message and doesn’t reply to me I would feel really sad. Did I say something wrong? Is he or she upset with me? I don’t care if they read it or not I just want to know if it was successfully sent” (P10). The read receipts function has made some participants hesitant to open messages from certain platforms like WhatsApp (P7).

4.3.5 Reminders: Constant Connectivity

After communications apps, reminders/calendar was the most commonly-used notifications category. Reminders are useful because they provide a way to externalize information.

P1 and P7 depended on reminders to alert them to take their medicine which demonstrated the criticality of the function. Many participants used the alarm clock reminder. Reminders like these make us more dependent on our phones. It is an example of a notification that usually has consequences if we do not react to it in a timely fashion. In general, while the international students set reminders for school assignments, native U.S. students used the reminders app more for mundane tasks like doing laundry or getting groceries (although there were a few exceptions of U.S. students who also used the app for
assignments). International students also discussed in-depth the importance of reminders for banking apps (e.g. P2, P11).

“Oh, there is another application that is really important. That is a calendar. That is very important. Especially after I come here” (P3).

According to P7, “I live on my calendar.”

“Calendar and message have the most important and useful information. Other apps are not worth it. They will overwhelm the true important other things. It will overlap. You will lose a lot of information that shows up on the screen” (P2).

4.4 WeChat, Cultural Norms and Smartphone Notification Organization

This study had a small sample, but there was a noticeable difference in the notification organization strategy of Chinese international students and the native U.S. students. The two groups used different patterns of mediums to express themselves. Overall, while the Chinese international students heavily relied on a single app for communications purposes, U.S. students used a diversity of apps. Of course this is not a blanket distinction and there was cross-over, but this was the dominant model. By applying Goffman’s theoretical framework of impression management theory, we examine the possible implications.

All of the international students interviewed used WeChat, a Chinese multipurpose app founded in 2011 with over 902 million daily users. WeChat was the main source of notifications, sometimes the only source. WeChat is a complex app. Much like the smartphone itself, it contains a menu of functionalities. Users can buy movie tickets, shop online, text others, and more. P14 repeatedly emphasized that WeChat was a “very comprehensive functional app.” He said “WeChat, you spend most of your spare time on that. Most of your leisure time happens on that platform. This is a virtual space.” P8 observed that “WeChat has all the functionality—that is one of the reasons why students are so attached.”
The participants praised the customizability of the app. WeChat users can configure the settings to receive notifications only from certain chat groups. This function was essential as participants belonged to dozens of groups, some of which had hundreds of members.

There was also the legacy factor. Participants liked WeChat because it allowed them to stay in contact with their friends and family in China (P2, P3, P8, P10, P13, P14). P10 said that her family only knew how to use WeChat. By 2018, WeChat had a large enough user base to make it the default communication tool. It was more convenient for users to stay active on the platform that was the norm in their home country.

P3 was critical of how centralized the platform was, saying “With WeChat, I will respond because in China everyone uses WeChat. But in America, there is no very common where everyone will chat with each other. When I first come here or group discussion I heard maybe three applications like Slack and GroupMe and Google and Microsoft team. I was like ‘Oh, there is no one standard? But I think that is good because if you only have one application for all people in the country to use the market is not very healthy. It’s like only one company to take part in this kind of business.”

From another international student’s perspective, the consolidated platform created obstacles for managing “impressions” (per Goffman’s theory) for multiple audiences. Delineating the work sphere and friend sphere could be challenging. P9 noted that she had to be careful to monitor her WeChat moments feed because potential employers could see it. She compared it to Americans’ ability to separate their work life on LinkedIn and their friend life on Facebook.

From an American student’s perspective, the downside to having multiple channels of contact was the potential redundancy and the inability to digitally “hide.”

P4 said “I was talking to people on Facebook and GroupMe and it was the same people given more or less but like with a few other different people so you know like I had a lot of different groups open and I was thinking like ‘Oh, isn't it funny that oh, you know Millennial culture is like having five
conversations with one person on different apps right?” She continued “I feel like the fact that a lot of people feel like they have so many different apps and communicative tools is an excuse to not reply back, whereas like back in the day when we just had text messages it was like all we could do it was kind of how we talked.”

Moreover, P4 would become frustrated if she discovered someone who hadn’t messaged her back posted or liked something on Facebook. Similarly, P7 noted that she saw a lot of people posting on one platform, but ignoring the person on another platform. She believed that it was very common to not want to reply to people because you haven't replied to them on another app, but that technology makes it easier to do “investigative” or “detective” work. Computer-mediated communication allows a new degree of visibility—posts on social media, read receipts, time stamps of conversation—leave a trail of digital clues of digital presence or of a past conversation.

Because WeChat has a large user base in China, but still a scarcity of users in the United States, the value of other communications apps changed for some international students. P2 declared, “If you ask me if there is any message that I don’t want to turn off forever, it’s iMessage… I want to receive a notification from iMessage anywhere, anytime. Because I assume that people sending me the message text message is people who knew me and have my phone and have very important things they are sending me by. That is my reflection. I think for your phone number you seldom give people” (P2).

Likewise, P3 said that if someone contacted her via SMS, she would respond immediately because she didn’t have many American friends. She said she considered using other communication platforms in the future, “So maybe later when I have more friends or more communication. I know this one--the messenger--I saw that many people use that.”

P8 and P2 liked how they could connect with American students though Facebook, Instagram, and GroupMe. They were cognizant of the downsides, though. P2 said that if they were to go back to China, they would lose contact through those means and would have to rely on email or Skype. P8 said
that adding American apps on top of her large inventory of Chinese app made managing her notification settings more difficult.

Having a variety of communication platforms allowed participants to assign different communication platforms to different social spheres of their lives, not limited to friends, family, work, and school. For example, one type of email would be associated with school information, while another type would be dedicated to personal interests. Within certain platforms, there were even more intricate ways to manage different circles. Apps like Slack and Discord offer different “channels” for different groups; Similarly, WeChat allows users to create their own smaller groups within larger groups. Social spheres operate on many different layers, and the platform design of the apps manifests that. The preconceived mental model that already categorized notifications made it easier for participants to evaluate a notification’s importance when it appeared on their screen.

The findings show two app structures—one promoting a consolidated identity, one a distributed identity. The findings prompt the question: how does a diversity of communication platforms (‘stages’) or a lack of platforms affect how the user tailors their personas? Secondly, what happens when two cultural norms of smartphone behavior intermingle? Future studies will need to explore these areas.
5. Discussion

It is easy to blame technology addiction on the tech companies. In envisioning the future, one of the participants predicted that “As long as they [the app companies] understand human nature, we will be dominated.” He believed that human nature was humans’ desire to receive attention, recognition from others, as well as human laziness. There is no question that smartphone culture—and with it, norms of connectivity, communication, and micro-escapes—has been normalized. But this paper would charge that the culture originates from a variety of sources, not limited to the technology, the individual, society, and human nature.

As participants of this culture, we are both the instruments and the victims. We conform to the norm. If you do not believe this, watch what happens when a professor announces a 10-minute break to the class: the students in synchronized fashion whip out their smartphones. Are they doing it to genuinely check for notifications? Are they doing it for a brief respite of entertainment? It is difficult to tell because the size of the smartphone affords privacy. Are they doing it because everyone around them is doing it? Either way, that pattern of behavior is recursive—it becomes reinforced each time. People emulate others’ behaviors and eventually it is adopted as expected, acceptable behavior. The findings of this study showed how parents influenced the mealtime-technology policy. It is easy to blame technology companies; it is harder to put the responsibility on our own shoulders.

Although today computers are pervasive, we must remember that it has not always been that way. Before computers were universal, they were esoteric. Before they were anchored to us, they were built into a desk. Before they were pocket-sized companions, they were appliances, and before that they were giant scientific tools. Before there was computer-addiction, there was computer-phobia. At one time, computers were imagined as distant, intimidating, abstract. Nowadays, smartphone computers are very much an intimate and social technology. The scale and size of the technology matters. The computers’ uses are not static, but flexible. In summary, we construct the meaning around the technology.
Many studies have looked at the interaction with the notification as an isolated event, but as Harmon & Mazmanian (2013) instruct, we must also look at broader social and cultural forces that interplay in this interaction. According to Harmon & Mazmanian (2013), “smartphones are embedded in varied and multiple practices of work, care, pleasure, and sociality.” Moreover, “[m]edia are not fixed natural objects” (Marvin 1990). The quote echoes Marvin’s (1990) parallel thinking. Technologies are “constructed complexes of habits, beliefs, and procedures embedded in elaborate cultural codes of communication.” Technological innovations evolve as a response to years of users’ negotiations of use with the technology. Our phones have become more sophisticated and more customizable. Technological innovations “mutate.” They respond to changing user needs/user experience. The notification settings have become more advanced. We curate our digital world and how it is presented to us.

A conversation about notifications cannot exist without a conversation about communication. Notifications are essentially your phone’s way of communicating with you. Your phone is also the intermediary that enables you to communicate with other people. The literature reveals that the vast majority of notifications received on smartphones are communication-based. In this study, the participants’ notifications inventory reaffirmed that finding; consequently, the majority of the interview time was dedicated to discussing the overlap of computer-mediated communication and social norms. This study tried to uncover what computer-mediated communication (which is oftentimes facilitated by notifications) meant to university students. It also tried to uncover what it meant for students who were living outside their home country.

Another theme of this study is control. Many participants reported that the interviews made them more self-aware of their own behavior, especially those who did the diary studies (P1, P5, P6, P7). There was no consensus on the overall perception of control. Some participants felt like they could not control their attachment, others felt they had a lot of control over their phone usage. Self-awareness is the first step in identifying our values. Furthermore, some participants viewed constant connectivity in a good light, while some did not.
This study illuminated the ways that users’ perception of control was not only associated with setting boundaries, but also with enabling receptivity. We saw inventive strategies for how users regulated notifications. We also saw how they interpreted the social and technological pressures that influenced their phone use and communication rhythm.
6. Conclusion

6.1 Challenges & Limitations

This study had a small sample size of 14 participants. The results are not generalizable beyond university students of the set age range, 18-26. Additionally, as this study incorporated interviews and diary observations, the self-reported data is inherently biased. Participants selected the notification episodes to discuss in the interview or write about in the diary studies and chose how they described their reaction. They may also have been biased in how they rationalized their behavior; the true causes behind their actions or habits may not have been the reasons that they stated. Moreover, some notifications are external from the user’s control. As such, the timing is unpredictable. It is difficult to ascertain if the week of diary observation collection was representative of their long-term habits. Again, this investigation was exploratory. It aimed to find insights, not proof.

The lack of uniformity of notification display across different phone types (iPhone vs. Android) was an anticipated challenge. The type of phone affects how the notification displayed and what functionalities were possible to configure. As a result, the participant’s phone type was documented in the interview.

Finally, if this study was repeated in the future, the interviews would be video-recorded. During many of the interviews, notifications would sound or appear on the interviewee’s phone screen. The reason why participants had their phone apps was because they were asked to go to their app settings to see for which apps they receive notifications. Participant reactions varied widely: some would completely ignore the notification, some would apologize and mute the notifications, some would tap on the screen. It would also be useful to capture the number of times that participants glanced at their phone or watch when they believed that the interviewer was not watching. In future studies, the survey would not use the
word “distracting” when it asked people to rate their experiences. The word has a negative connotation. It would be changed to word with a more neutral connotation.

Researchers should also consider collecting quantified data of response behavior (like response time to notifications) to match the experiences shared in the interviews.

6.2 Contributions

Smartphones are an integral part of our rapidly transforming lifestyle. This study looked at themes of constant connectivity, phone attachment, perception of control, and shared expectations through the lens of Goffman’s impression management theory. It compared native U.S. student’s phone behavior with that of Chinese international students. The results reveal that both groups share common ground in their evaluation of notification content: what types of notifications they find annoying and which ones they find most valuable or usable. Additionally, both groups had mixed perceptions of control, and mixed patterns of receptivity. Where they differed was largely in the sources of notifications. Chinese international students mainly interacted with WeChat notifications. American students typically interacted with a wider range of communications apps.

6.3 Implications

This study is relevant to the field of ubiquitous computing because the number of devices that will be connected to the internet will likely increase in the coming years. For the devices to be useful, they need to communicate to humans and the other connected devices the right information at the right time. As a result, there will no doubt be new methods for these devices to communicate with people. The smartphone is a test case for what is to come.

This study was as much about people’s interaction as it was about human-computer interaction. It is often said that the most successful technologies are those that are invisible. The point of notifications is to attract your attention to the technology. In this way, the interruptive behavior of notifications makes it
more challenging for users to be engaged in conversations with others but also to be mindful. As much as we want to believe that we can distribute our attention in multiple areas, it is not the case.

This study helps us learn about the notification management component of the user experience. The insights can inform future design decisions for smartphone notification systems.

6.4 Future studies

The following research questions demonstrate directions to be explored in future research.

- How do users orchestrate notifications on multiple devices, i.e. smartwatch, smartphone, and computer? How effective is each channel of information at communicating the content of the notification? What types of notifications should be received on each device? How should the devices communicate with each other?

- How are health-related notifications evaluated for privacy?

- How aware are users of their phone attachment? How does their perceived behavior align with their actual behavior?

- What makes a smartphone notification relevant?

- Why do users feel there is a need for “performance” (e.g. appearing busy) in certain social environments?

6.5 Design Recommendations

- Analyze usability of system settings. Many participants were confused about how to change a certain setting or were unaware about what was possible to them. Transit, email, advertisements, social, and reminder apps were among those mentioned of which participants wished they knew how to configure.
- **Re-think red badges.** This type of notification was by far the most disliked. They are frustrating because they do not signal information about what the notifications contain, only the number of notifications. A video camera would have been useful to capture participants’ expressions when they were describing the red badges.

- **Group notifications based on app category.** Users described how when they were inundated with notifications, it was easy to miss the important ones. If the notifications were already grouped by category or platform, it would be easier for them to prioritize. The structure principle of design states that related things should be grouped together and unrelated things should be separated.
7. Bibliography


19. Marvin, C. (1990). When old technologies were new: Thinking about electric communication in the late nineteenth century (pp. 8). Oxford University Press, USA.


8. Appendix

RESEARCH QUESTIONS

Overarching research question:

1) How do people make sense of and manage smartphone notifications?

Sub-questions:

1) How do people evaluate the importance of a smartphone notification?
2) What strategies do people adapt in order to regulate smartphone notifications?
3) How are smartphone notifications shaping and being shaped by social expectations?
NOTIFICATION TYPE EXAMPLES

There are different types of notifications, from sound alerts, visual alerts, or haptic alerts. The notifications below are a sample of notifications from Apple iPhones.

Figure 1. Message and email notifications on an iPhone lock screen

Figure 2. A reminders notification appearing when another app is open inside an iPhone

Figure 3. The red circles above the app icons are red badges

Figure 4. News notification on an iPhone lock screen
CONSENT FORM

Consent Form

University of North Carolina at Chapel Hill
Research Information Sheet

IRB Study #: 17-3256

Study Title: The Impact of Social Norms on Users’ Smartphone Notification Management Strategies

Principal Investigator: Cami Goray

The purpose of this study is to see how people manage their smartphone notifications. You are being asked to take part in a research study because you are a University of North Carolina-Chapel Hill undergraduate or graduate student.

Being in a research study is completely voluntary. You can choose not to be in this research study. You can also say yes now and change your mind later.

If you agree to take part in this research, you will be asked to answer some questions about what notifications you receive on your smartphones and the strategies you use to manage them. If you choose to also participate in the diary observations portion of this study, you would complete a survey twice a day about your experience reacting to notifications. We expect that 20 students will take part in this research study.

The possible risks to you in taking part in this research are:

- Potential loss of confidentiality of data

The possible benefits to you for taking part in this research are:

- Contribution to generalizable knowledge
- Self-awareness of smartphone notification management

To protect your identity as a research subject, the research will not be stored with your name, the researchers will not share your information with anyone. In any publication about this research, your name or other private information will not be used.

If you have any questions about this research, please contact the Investigator named at the top of this form by calling (919) 610-2315 or emailing P.I. Cami Goray cami_goray@unc.edu. If you have questions or concerns about your rights as a research subject, you may contact the UNC Institutional Review Board at 919-966-3113 or by email to IRB_subjects@unc.edu.
INTERVIEW AND DIARY STUDY QUESTIONS

(This is only a list of the potential questions. Most questions were developed during the interviews.)

Pre-session interview:

*Background on phone:*

1. What type of phone do you own?
2. What do you like or dislike about your smartphone?
3. How would you rate your attachment to your smartphone?

*Inventory of notifications:*

1. For what apps do you receive notifications on your smartphone?
2. When you download an app, what prompts you to accept receiving notifications? What are you thinking? What influences your decision?
3. Are there any apps that you have downloaded notifications for, but never read or act on them?
4. Do you customize any settings for notifications? If so, why?
5. Are there any notifications that you have retroactively permanently disabled? Why?

*Notification response behavior:*

1. Do you have any personal strategies for how you answer smartphone notifications?
2. Do you find any notifications distracting? If so, which ones and why?
3. Do you find any notifications useful? If so, which ones and why?

Post-session interview:

1. Describe a time that you felt pressured to react to a notification.
   a. Where did the pressure come from? Where do they originate: Organizational norms? Friends? Family? Power dynamics?
2. Describe a time when you limited your smartphone’s ability to alert you.

3. In what ways did you make yourself more available (or responsive) to notifications? Why?

4. At what times or in what settings were you most responsive? Least responsive?

5. Reflecting on your behavior over the past week, did you notice patterns in how you perceived the notifications? (Show answers in diary observations for recorded participants recorded thoughts and feelings).

6. Did they ever find yourself checking their phone out of habit?

7. Overall, do you feel satisfied with how you receive smartphone notifications? Why or why not?

8. Is there anything else about your experience that you would like to share?

9. Do you have any questions for me about the study?
Diary Study Questions:

<table>
<thead>
<tr>
<th>Q5</th>
<th>What is the category of the smartphone notification?</th>
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<tbody>
<tr>
<td></td>
<td>- communications (text message, email, social)</td>
</tr>
<tr>
<td></td>
<td>- entertainment (news, games, music)</td>
</tr>
<tr>
<td></td>
<td>- tools and utilities (calendar, alarm clock, reminders)</td>
</tr>
<tr>
<td></td>
<td>- system internals (updates)</td>
</tr>
<tr>
<td></td>
<td>- other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q1</th>
<th>What were you doing when you received the smartphone notification?</th>
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<tbody>
<tr>
<td></td>
<td>(e.g. in class, eating with a friend, sleeping)</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Q2</th>
<th>How did you react? Why did you react in that way?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(e.g. ignored, immediately responded, opened app)</td>
</tr>
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</table>
Q3. What were you feeling once you experienced the notification?
(e.g. annoyed, happy, empowered, neutral)

Q8. How distracting would you rate your notification experience?

<table>
<thead>
<tr>
<th>Not at all likely</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Extremely distracting</th>
</tr>
</thead>
</table>

Q7. Any other comments about your experience?
(e.g. specify smartphone notification app type, content, why you reacted the way you did)

Q10. You may choose to upload a screenshot of notification or screenshot of where you were when you received the smartphone notification.

Choose File: No file chosen
RECRUITMENT EMAIL

Smartphone Notifications Management Study

Be part of a research study that is investigating how people's perceptions of social norms impacts their smartphone notification management strategies.

Procedure:

You may choose to participate in one of two ways.

OPTION 1: Interview

• up to 45 mins

OPTION 2: Interview & Diary Study Observations

• pre-study brief (15 mins) + 1 week of diary study observations about smartphone notifications (2 surveys/day) + post-study interview (30-45 mins)

Compensation:

• Participants who complete OPTION 1 will receive a $10 Starbucks gift card.
• Participants who complete OPTION 2 (submitting at least 10 surveys) will receive a $20 Starbucks gift card.

Eligibility:

• Participants must be currently pursuing an undergraduate or graduate degree at UNC-Chapel Hill and be between 18 and 25 years old.
• Participants must own a smartphone.

Participation in this study is voluntary. You do not have to participate if you don’t want to.

This research has been reviewed by the UNC Institutional Review Board, IRB Study #: 17-3256.
Contact:

For more information, please contact Cami Goray.

cami_goray@unc.edu