“I’m just trying to survive”: An Ethnographic Look at Mobile Notifications and Attention Management

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Abstract

There is a prevailing sentiment in popular culture that we have become too attached to our phones. Smartphone notifications play a critical role in drawing people’s attention to their phones. As user experience researchers on the Android team at Google, we used an ethnographic approach to understand how people experience smartphone notifications. We conducted an ethnographic study of smartphone users in New York City, while engaging members of our product team (including product managers, engineers, and designers) in the data collection and analysis. In this case study, we describe our research methods, what we learned about notifications’ role in people’s lives, and discuss the impact that our research has had on various product teams at Google.

Author Keywords

Notifications; smartphones; attention management; ethnographic research; user experience; mobile user experience.

ACM Classification Keywords

Human-centered computing: Ubiquitous and mobile computing: Ubiquitous and mobile devices: Smartphones.

Introduction

There is a prevailing sentiment in popular culture that we have become too attached to our phones [6]. Indeed, research has shown that on average people look at their phones 46 times per day [4]. Mobile push notifications play a critical role in drawing people's attention to their phones. As user experience researchers on the Android team at Google, we used an ethnographic approach to understand how people experience smartphone notifications. Do users find notifications annoying or useful, and why? What are some qualities of effective notifications? How do users respond and perceive different notifications at different times of their day? The Android smartphone platform has over one billion users so the answers to these questions could have a significant impact not just on our product team but Android app developers and Android users [1].

We set out to answer these questions by conducting an ethnographic study of smartphone users in New York City and engaging various members of our product team (including product managers, engineers, and designers) in the data collection and analysis. In this case study, we describe our research methods, what we learned about push notifications' role in people's lives, and discuss the impact that our research has had on various product teams at Google.

Research Methods

Research Approach & Research Questions

We chose to take a broader approach to the research, focusing not only on mobile push notifications, but on attention management and distraction, including device notifications and distractions from other people, our own minds, and everything else in our environments.

We had three primary research questions:

- What type of information do people want to learn from a notification?
- When do people want to be notified?
- How should information be presented so that it is most actionable and effective?

We also wanted the research to build a foundational understanding of the problem space within our product team, to inform the development of the Android N 2016 release, and to generate ideas for future Android releases.

Research Process

We used a qualitative mixed method approach to capture people's feelings, attitudes, and behaviors around mobile push notifications. We utilized in-depth semi-structured interviews, full and half day observations, and group discussions amongst a participant and his/her friends. Since notifications are inherently "in-the-moment" and fleeting, we needed to observe how our participants dealt with them while immersed in their daily activities. At the core of our research were in-depth semi-structured interviews and full or half day observations with ten participants (one pilot session in the San Francisco Bay Area and nine in and around New York City). With this phase of the

research, we learned from participants about how they dealt with distractions, managed their time, and the role that notifications played in their lives. We then observed them for four to eight hours as they went about their day. We observed everything from a stay-at-home mom caring for her young children during a day off from school, an athlete meeting with her coach while she recuperated from an injury, to a busy attorney working from home. We asked four of these participants to bring along two of their friends for a follow-up 2-hour session that included group discussions and design exercises. Eight additional participants took part in the buddy sessions.

Overview of Participants

Of the eighteen total participants in our sample, thirteen were women and five were men. Participants were socio-economically diverse with occupations including college professor, digital editor, chicken wrangler, full-time student, playwright, actress/model, and journalist.

Data Analysis

We involved our product team in the data collection and analysis. Our research team was comprised of eleven people from the product team, including three user researchers, five engineers, one interaction designer/design lead, and two product managers. During research sessions, team members participated by taking photos and notes, observing participants, and asking questions. Afterwards, team members wrote down their observations on post-its. We then involved the entire research team in an initial clustering of the data. Lastly, the user researchers used emerging patterns from the clusters to form a framework for understanding mobile push notifications.

Notifications are Necessary for Survival

As participants told us about how they manage their attention in their daily lives, we saw a parallel between notifications today and communication sources from the past. Throughout history, people have needed to receive information from other sources. From telegrams, carrier pigeons, smoke signals, to town criers, there has been a need to transmit and receive urgent information in order to survive.

In more modern times, communication channels have become polluted with other ad hoc sources: mailboxes becoming filled with junk mail, doorbells rung by salespeople, landline phone calls from telemarketers, emails inboxes filled with spam. Mobile push notifications, which were initially created to signal a new incoming SMS or email are now filled with app notifications containing messages ranging from trivial to important [3, 4].

Hyper-vigilance and addiction

Participants told us that they felt too attached to their phones, for fear of missing something important. Without a phone by their side, they risk missing potential signals of danger, new information that is important, or positive social interaction. With all of the incoming information from smartphones, participants have become so hyper-vigilant that it is extremely difficult to disconnect from their devices.

"If I don't know where my phone is for two seconds, I freak out. What if I miss something?!"

The attachment to phones has also impacted social interactions [2, 5]. Participants spoke about the

challenge of resisting the need to check their phones in a social setting, while trying to be present and avoid being discourteous. They described how people might be physically in the same room, yet socially disconnected.

"I don't even see my sister's eyes anymore, just the phone in front of her face and her thumbs moving. Then she suddenly laughs or gets angry, and I have no idea why."

Even participants who blocked all incoming notifications on their smartphones were still addicted to manually checking their phones.

"Even without notifications, I still have a nagging pull. I think, 'Maybe I have an interaction' (on my phone). It's either this internal pull or this external signal pulling you, but either way, you're getting pulled away."

Coping strategies to block out the incoming noise

Every participant showed us at least one workaround they had created to filter out unnecessary incoming information. Some participants physically put the phone away, in a bag or box, to minimize distraction.

Almost all participants adjusted settings to not let the device make noise (turning on Do Not Disturb mode, turning off the ringer, turning on/off vibrations). Some participants only made these adjustments in certain social settings, while others kept this as a constant setting (the phone would never make any sound, not even when at home).

Another common strategy was to block contact from outside sources, by activating airplane mode or adjusting phone settings to block all notifications. The most extreme case, which we heard many times, was to uninstall (or never install) an app and use the mobile website instead, to bypass receiving notifications. This has serious implications for app developers, showing the ramifications of sending too many notifications to users.

The last strategy we observed was to do nothing but risk being constantly annoyed. A few participants recognized that they could adjust notifications settings somewhere, but it felt like a hassle to investigate how to do this.

The need for more shortcuts

Because of the amount of distraction and effort involved in checking each notification, participants used visual, auditory, and haptic cues to preemptively determine how necessary it is to tend to the notification. And they wished for more shortcuts to convey a notification's source and content, without looking at the content in its entirety.

"I'm a very visual person. I associate things by color. I wish that I could color-code my notifications."

What Do People Want to Know?

Of all of the different types of notifications that participants received, there were only two types that they considered important and useful: notifications from other people and notifications that remind them of tasks that they need to do.

People are the VIP notifications

To all of our participants, the most important notifications were ones that are sent from other people, such as emails, SMS, and chat messages.

Within that category of notifications, there are also VIP people-- those in our inner circle for whom we keep communication channels open, so they can contact us at any time.

"Work emails and texts from my wife are the only things that matter. Basically the things I need to tend to so I don't get in trouble."

Participants said that notifications from other people are also important for maintaining social connections. Communication with others fulfills social contracts and obligations.

But there are also consequences for not replying soon enough; there are expectations and etiquette for responding. This adds to the pressure of being aware of incoming phone notifications, especially ones that are sent from someone from the inner circle.

"I once broke up with someone because they didn't respond, and I know they read the text because I saw the read receipt."

Lastly, it feels good to be thought of and needed by other people. The potential for positive social contact also keeps people attached to their phones.

"Notifications from other people make you feel your existence is important."

Help me remember the things I need to do

As we shadowed participants throughout the day, we observed them trying to complete long mental and physical to-do lists, while managing the incoming notifications and interruptions during their day.

"Let's see...currently on my mind are: clean the chinchilla cage, go to Trader Joe's on the way home to buy coffee for my friend, get the dog out of the car, confirm the play date I set up for tomorrow, order new keys for the Prius... I could go on and on."

"I keep a weekly to-do list in my planner. I keep things in my unread email in Gmail that I need to do long-term...I'm just trying to survive."

The most appreciated and relied on notifications were the ones that reminded users of something that they need to do. Participants have hacked together personal systems to help them organize and remember their to-do lists. These systems included various combinations of tools: paper planners and lists, digital calendars, email, text messages, photos on smartphones, reminder apps, phone alarms, timers, and more. These tools help people Offload, View, and Do their tasks. We saw the Do phase as one where push notifications could be most useful.

"Since I missed my flight last time, this time I set a calendar reminder, an alarm on my phone, and made my friend keep texting me every 30 minutes to make sure that I'd get home on time and get a good night's sleep."

With busy lifestyles and all of the interruptions and phone notifications throughout their day, participants talked about the constant stress they experienced. And the anxiety of potentially missing an important task also kept them attached and hyper-vigilant to their smartphones.

How Do People Want to Know Things? What, When, and How to Notify

Task + urgency: four types of notifications

Based on our data, we developed a framework to illustrate how the experience of receiving notifications can depend on the combination of two dimensions: Enjoyability and Urgency.

Figure 1. This framework combines the dimensions of Enjoyability and Urgency to describe 4 types of notifications.

A notification would be perceived differently if it were an enjoyable task compared to a painful task. Similarly, a notification could be perceived differently if it were an urgent matter compared to a non-urgent matter. Combining these dimensions, all of our participants' notifications fell into one of four categories: VIP, Mission Critical, Nagging Reminders, and Fun Distractions.

VIP: Enjoyable + Urgent. We keep our channels open for the VIP people in our lives, our inner circle. Some examples of these notifications are SMS from a spouse, a reminder about a social event for a good friend, or an alert from a baby-cam signaling your baby's movement in the crib. A design implication could be to highlight these notifications, to more easily bring attention to these amidst the other less important notifications.

"The most important people in my life-- my parents, best friends, ex-husband, son-- I always make myself available so they can reach me."

Mission Critical: Painful + Urgent. These notifications are often about unenjoyable tasks, things that are important for survival and have deadlines. Some examples include emails from your colleagues or a reminder about a deadline for renewing a passport. Design implications include delivering these notifications at the right time because they are time-sensitive, and clearly communicating the consequences of not doing the task.

"My work emails... those are the really soul-crushing alerts. And tasks that are given to you by your device, that you didn't voluntarily take on. They're oppressive, and not on your own terms."

Nagging Reminders: Painful + Non-urgent. These notifications are about tasks that are mildly unpleasant and also not urgent. Examples include paying a utility bill, and messages suggesting that you update your smartphone's operating system. Design implications include reminding people when they are in a position to act, and adding accountability by allowing users to snooze the notification.

"I know I have to pick up my dry-cleaning. But telling me right now is not going to help me, it's like nagging. Tell me when I'm near the dry cleaner!"

Fun Distractions: Enjoyable + Non-urgent. These notifications are about enjoyable tasks, things people often do to procrastinate. We heard examples like checking social media, playing games, participating in group chats, and reading news articles. Participants told us that perhaps these notifications aren't necessary; they enjoy these tasks and do them so often through the day, that they would check the apps periodically anyway.

"I love [popular smartphone game], I'm so addicted. But I hate their notifications, like 'You have 5 more lives!' because I already know that. I was going to play it anyway, you don't need to tell me."

Violation of principles impacts effectiveness
Looking through all of our participants' examples of notifications ranging from effective, annoying, to completely useless, we developed four principles by which notifications should abide. These principles also apply to the types of notifications presented in Figure 1. Because the urgency dimension is closely related to time, the way people perceive notifications can evolve over time. When notifications violate these principles, they potentially diminish in value and impact.

Relevance. Only send messages that matter to the user. When it is not relevant, it becomes unnecessary noise. In this example, the same notification was experienced differently by recipients, because of the difference in relevance; what was enjoyable for one recipient was annoying to others:

"I like that [photo sharing app] reminds me everyday at 6pm- 'you haven't posted a photo of your child yet.' But my mom, dad, and sister all hate that notification because they are never going to post a photo; they only joined to look at my photos! So they all turned off their notifications."

Selectivity and Differentiation. The message should be worth the cost of the user's attention; be selective of what to send. If messages are too excessive, users may discontinue them. If the content of notifications are not differentiated, users may stop noticing them over time.

"[Popular social networking app] sent me way too many notifications, so I deleted the app."

Legitimacy. The importance of the content should align with the urgency signal. Critical issues are worth the attention, while non-critical things should be unobtrusive. When unimportant alerts are disguised as urgent, it tricks the user into unnecessary anxiety, and they may resent the source.

This was perhaps the most annoying violation to our participants. When notifications without a legitimate reason for receiving attention "cry wolf" in the user's VIP area of consciousness, participants felt most frustrated.

Actionability. Notify users at a time when they are able to take action. Give users options to delay, at their discretion, and allow them to retrieve the message later. Help users prioritize by stating the implications of inaction and whether there is a deadline.

When notifications are nagging reminders without a specified consequence, participants ignored them over time, until one day it became a mission critical task.

"I hate updating my OS. So I just keep putting it off, until one day an app told me I cannot use it anymore unless I updated my OS. Then I spent an hour deleting things to make more room for the update."

Figure 2. This diagram illustrates examples of different types of notifications, and the shifts that can happen over time when principles are violated.

Discussion

By taking this ethnographic approach to notifications, we were able to explore how notifications, which were once welcomed and helpful, have become polluted with unwanted information. Whether users allow notifications or block them, people have acknowledged an addiction to their phones and experience a fear of missing something important. We observed several strategies created to cope with the abundance of

notifications and the use of sensory cues to determine the importance of notifications.

Our study showed that of all of the types of notifications received, users cared most about notifications that are from other people and/or help them accomplish their tasks. We developed a 2x2 matrix to classify four types of notifications by urgency and enjoyability. Depending on how urgent or enjoyable the task, users may be more or less motivated to act upon those notifications.

We also developed four principles for effective notifications. When messages are irrelevant or are not sufficiently differentiated, users could begin ignoring them over time, until the message has no impact and becomes unnecessary noise. When users are repeatedly interrupted from their tasks to check an incoming notification on their phone, to find out that the message had no legitimacy, this can result in frustration and resentment over time. When notifications are not actionable in the moment, users can forget about the task and ultimately miss deadlines. As these principles are violated, even the experience of receiving positive notifications (e.g., from friends, fun game apps, news) can become unpleasant over time. Users can also begin to develop negative feelings toward an app, or even uninstall it and stop using the service.

Implications for developers – the goals of users and developers are misaligned

Our framework and principles speak to the *user's perspective* on receiving notifications. However, the *developer's perspective* is very different. While users want notifications to help them stay on top of their

lives, developer goals include fulfilling service obligations and promoting engagement of their service. Users and developers have competing goals and different perspectives on priority and urgency.

Users' Goals	Developers' Goals
Help me stay on top of my life	Fulfill service obligations
Give me confidence I will receive my VIP notifications	Promote engagement

Table 1: This table illustrates the misalignment between user goals and developer goals.

Understandably, from the developer’s perspective, it can be quite challenging to know each individual user’s context and preferences. We feel it is important for app developers to consider the potential impact that their notifications could have on users. Does this notification bring value to the user? Is this notification potentially urgent, and if so, when or how should it be sent, such that users can determine its priority and act upon it? How does this notification enhance the user experience of the app/service?

From this research, we feel strongly that developers should **protect users’ attention by being respectful and thoughtful in each notification that is sent.** A change in attitude and practice could benefit modern society by positively impacting people’s relationships with their devices and decreasing the amount of daily distraction.

Challenges and limitations

We faced challenges and limitations throughout the course of the research. In a corporate environment

where quantitative data and statistics are valued and relied upon to make decisions, we spent extra effort to convey the value of a qualitative approach and to encourage participation from product team members. Our entire cross-functional team adjusted their fast-paced schedules to accommodate the travel and research sessions. Team members later reflected on how unique and useful of an experience it was, to be immersed into the lives of participants and hear first-hand their thoughts on notifications.

As UX researchers, we feel this type of methodology and team involvement is critical to a product’s success. Our team members now have memorable user stories and concrete examples to draw from while they are designing and implementing product features. Our output provides the team with a shared understanding of the problem space, and a framework and principles to inform future decision-making.

We also balanced the needs of natural observation (e.g. 1-on-1 observation by one researcher) with needing to immerse our team members into the research. We compromised by including some shorter interviews and observations, led by one researcher and one to two stakeholders at a time. Doing so allowed team members to participate in the research, while minimizing the impact on participants.

It may be useful to complement this qualitative study with other methodologies. Quantitative data and metrics could help us measure user behaviors around notifications. Longitudinal studies could explore how users experience notifications over time. Would their needs for notifications change depending on familiarity with a service?

Lastly, our research was conducted in only one city within the United States. While we believe that our findings and conclusions are foundational in nature and speak to fundamental human behaviors, we would like to replicate this study internationally. We could evolve or strengthen our framework by observing participants in cultures where people may relate to information differently (e.g., perhaps some cultures welcome and expect to receive more pushed information). If such an environment exists, how might people feel differently toward notifications, compared to those living in the United States?

Conclusion

Through this ethnographic approach, we observed users inundated with push notifications and identified the need for developers to carefully consider each notification they deliver. With the goal of protecting users' attention in mind, we began to work toward this change in attitude and practice:

- The next Android operating system release (Fall 2016) has new features that were informed by our findings.
- This research informed an update of our notification design guidelines, which are used by Google and third party app developers.
- We met with over 10 product teams within Google to inform their notification strategy.
- We presented at a conference of external Android app developers to bring awareness to this issue and suggest they rethink how they approach notifications.

- We presented at Google I/O 2016 to a wider audience of Google developers and enthusiasts.

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