The evolution of push notifications: from reminders to communication to marketing

A Research Paper submitted to the Department of Engineering and Society

Presented to the Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

Sofia YuXin Yang
Spring 2024

On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Advisors

William F. Stafford, Jr., Department of Engineering and Society

The evolution of push notifications: from reminders to communication to marketing

Introduction

Push notifications are an alert, typically in a pop-up, that is generated to notify the user of a new message, update, social media post, etc. A push notification also creates an effect of wanting the user to take some action (Scale-e, 2023). With the rise of applications being developed, notifications are becoming more common and diverse to attract people's attention to use the app or be notified of an upcoming event. Due to this rise of notification usage and notification generation, notifications have started to evolve from more than just being a way to alert users of usually urgent events to a form of communication between user and user or developer to user to a method of advertising and marketing for different applications to get more users to use their application.

Sociological discussion of notifications

The goal of this Science Technology and Society (STS) paper is to analyze the evolution of notifications for the technological portion and analyze how the current form of notifications affect the user experience which is the social aspect of notifications. From a social perspective, there are two main social groups that are associated with notifications, which include the developer social group who create and send the notifications, such as Instagram and Facebook, and the user social group who receive the notifications.

The developer social group considers what content to include in the notifications to reach the purpose of the notification, whether it be simply reminding the users of certain events or to attract the user to use their technology for the company's profit. The developer social group also

considers how they can allow users to customize the notifications based on the user needs, such as allowing users to limit the number, frequency, and types of notifications that are received. The other social group associated with notifications are the end users, which are the ones who receive the notifications and do the potential actions in response to receiving the notification. The end user social group are also the ones who are in control of whether they choose to receive notifications and if the end user chooses to receive notification, they are also in control of what action they take upon the receipt of the notification.

The different social groups also have different incentives to make use of and develop notifications. To the end user social group, they want to use notifications to keep on task and be aware of certain events. While the developer social group, depending on the purpose of the notification, they may want to simply help users be reminded of certain events and tasks, or earn profit by having the user make use of their application. For example, applications such as habit trackers, that are meant to help users reach their goals will be incentivized to focus on developing features to adapt to the needs of the end users. Alternatively, social media applications, benefitting from user interaction, may choose to focus on the content of the notifications being delivered to the end user to increase their traffic. This section defines the social groups involved with notifications. The following sections will discuss how notifications have evolved over time, starting with notifications in the form of reminders.

Notifications as Reminders

Notifications started as a simple form of reminders, since the usage of notifications started way before the well known operating systems like iOS and Android existed, even before

social media applications existed. As reminders, the notifications to let users know that they had missed a phone call, received a voicemail or received a message. Basic methods of communication between person to person and notifications were used to alert users about some piece of information. In the early stage of notifications, developers saw this as a method to send information to users. The developers did not have many restrictions placed on them, since the phone carriers wanted to make notifications a method of connecting developers to users (Goode, 2019).

Notifications in their original form of reminders was significant because this method allows for users to receive the notification in a timely manner. In addition, the information being delivered could be considered as relatively significant, since they were usually associated with users receiving a voicemail or receiving a text message notification. The importance and significance of notifications as a reminder are also displayed in the design of notification. Before color screens, there was the little circle icon on the top right corner of the application that helped to indicate the existence of a notification. With color screens, the alert of a notification is what is traditionally seen today, with the red circle in the top right corner of an application to get the attention of the user and let the user be more aware of the existence of a piece of information being delivered to the user (Goode, 2019). This section defines notifications as a form of reminders. The following section will discuss how notifications evolved to be a form of communication between users and developers and the significance of this phenomenon.

Notifications as Communication

Notification as a method of communication started in 2009, where Apple was the leader in making a significant contribution to the development and evolution of notifications. In 2009, Apple pushed out a system called Apple Push Notification Service (APNS). This allowed application developers to send immediate, real-time notifications to their users (Keireto Team, 2023). This service was a way for developers to easily deliver their desired information to their users. With the development of this service, developers were able to decide the priority of the notification, but exactly when the notification was delivered to the user's device was determined by Apple (Stringfellow, 2023). In addition to the original notification design, the developers were able to add sounds to get the user engaged and help enhance the user experience. Following Apple's development, Google also pushed out a system called Google's Cloud to Device Messaging (C2DM) that allowed the Android developers to also send immediate, real-time notifications to their users (Keireto Team, 2023).

With the notifications as a method of communication between developers and users, users started to receive more notifications and information that come from different applications. Since notifications as a form of communication created a channel for developers to directly send information straight into the user's hands. In addition, the design of the services allowed for large amounts of customization from both the user and developer ends. The developers are able to customize the content being placed in the notification and how the notification is being delivered to the user, such as the sound of the alert. In addition to increasing the user interaction and retention, this also created an opportunity for the developer to create a way for their application to stand out and develop their brand. For the users, they are able to decide and manage what notification they want to and do not want to receive. This allows users to only choose the

messages they believe are necessary or useful to them (Keireto Team, 2023). This section defines notifications as a form of communication and its significance. The next section will discuss notifications as a form of marketing, which is also the current form of notifications.

Notifications as Marketing

Notifications started to become a means of marketing, since notifications as a form of communication showed high numbers in users' retention rate, engagement rates, conversion rates and return on investment (ROI). Data shows that push notifications have increased the clickthrough rate by 700% (Scal-e, 2023). The clickthrough rate, CTR, is a ratio that represents the number of times the notification was clicked on versus the number of times the notification is shown ("About Google Ads," n.d.). Data also show that push notifications have increased retention rates by 93% and ROI by 3500%. In addition, push notifications also provide developers with a way to communicate with users real-time since users are able to see the message directly on their phone, unlike other messages where users need to navigate to a website or application to read the messages (Scal-e, 2023). Furthermore, estimates also show that 45% of iOS users and 91% of Android users have notifications turned on for the applications downloaded on their device (X2 Private Limited, 2022). These statistics from push notifications allowed developing teams and companies to view notifications as a way to increase the traffic on their app. Which is the main reason developers started to make notification content more geared towards marketing for the user to use the application. This section ends the discussion of the evolution of notifications, from reminders to communication to marketing. The following sections will explore multiple case studies that discuss the responses received from users when receiving notifications in this marketing form.

Case Study

In a series of experiments, researchers conducted multiple experiments, working with multiple user groups of different types of phones (Android and Google Play), to receive data on the different types of reactions, emotions and response times that resulted from receiving different types of notifications. In the experiments, participants' notifications were monitored through a third-party application that could keep track of the time between the notifications being sent to the user and the user responding to the given notification. In addition, throughout the experiment notifications were randomly chosen, where the participants would be asked to optionally give qualitative feedback on their feelings, level of distraction and rating the notification's importance. This allowed participants to reflect on the notification that was received and they were able to rate and provide open ended feedback on how the notification made them feel. (Shirazi et al., 2014; Pielot, Church, & De Oliveira, 2014; Mehrotra et al., 2016)

In the experiments, it was observed that notifications regarding emails were associated with negative emotions. This was due to the fact that most email notifications were often work related and involved the participants to immediately respond. Social media notifications, such as Facebook and Instagram, are distracting because they were often not useful to the participants. Messaging related notifications, such as WhatsApp, were also distracting because some messages weren't important, but the participants felt the need to reply or were simply distracted by the notifications. In addition, the experiment data also show that negative emotions are associated with messages that come from non-family or friend senders.

For the experiments, the seen time of a notification was the time between the arrival of the notification and when the user actually saw the notification. Response time is the time it took between the user seeing the notification and when the user reacted to the notification, such as dismissing the notification and clicking into the notification to interact with the application as desired.

The findings show how the different types of notifications resulted in different speeds of response times. The experiments found that messaging related notifications resulted in the quickest response times because they were often associated with events that were occurring in the near future or the receiver perceived the person they were communicating with as important. Email and social media notifications had longer response times, because the participants perceived the notification as not urgent. Even if the email or social media notification was considered urgent, it still resulted in a longer response time because the content of the notification required more effort for the participant to react and process the message. In addition, there are also findings indicating that notifications the participant considered as important did not result in quicker response times, but messaging related notifications had quicker responses.

On top of the type of notification that affected the seen time, the way the notification was received also had an impact on the seen time. It was found that vibrate only notifications were responded to the quickest, with an average response time of three minutes and 21 seconds. Notifications that had both sound and vibration were second, with an average seen time of four minutes and 50 seconds. Notifications with only sound were third, with an average seen time of

five minutes and 57 seconds. Lastly, notifications that were sent while the phone was on silent mode had the longest average seen time of seven minutes and 20 seconds.

The type of tasks that the participant was involved in when receiving the notification also had an impact on the seen time. It was found that when the user is actively doing some form of communication, there was a lower seen time, with an average seen time of 47 seconds. On the other hand, while the user was not engaged with their phone, there was a significantly higher average seen time of nine minutes and 30 seconds. For notifications that were received while the participants were engaged with other activities, such as work or traveling, the data didn't show to have an effect on the seen time, and the notifications received had an average seen time of five minutes and 45 seconds.

On top of the type of task the participant is engaging in impacting the seen time, the level of complexity also has an impact on the average seen time. The complexity of the task was determined through user definition, for the notifications the user were asked to rate on a scale of one to five, where one represents a low task complexity and five represents a high task complexity. It was found that the more complex the task was considered as, the quicker the seen time of the notification. While the shorter seen time was associated with less complex tasks. The researchers believe this is due to the fact that the participant was likely more attentive and able to view incoming notifications in the process of completing a more complex task.

There were also findings about which situations caused the participant to think a notification was distracting. The experiments found that when the participant received the

notification during a more complex task, the more distracting the notification felt. On the other hand, when the task was less complex and required less attention from the participant, the notification felt less disruptive.

The level of completion of a task also had an effect on how distractive the notification felt to the participant. It was found that the notification felt the least distracting when the user is not involved with any task or when they just started a task. When the notification was received while the participant was highly involved with a task, the notification was perceived as more distracting.

The sender of the notification also had an effect on the level of the distraction the notification was perceived as. The experiments found that the most distracting senders were non-human senders, such as promotional or automatically generated notifications, and subordinates. The second most distracting sender were service providers and colleagues. The least distracting sender were extended family members.

Finally, the task that the participant was involved in also has an influence on the level of the distraction that notification was perceived as. Participants found receiving notifications while working was the most distracting. This included after work, traveling or on leisure, participants found the notification distracting. When the participant was not involved with any tasks, they perceived the notification to be less distracting (Shirazi et al., 2014; Pielot, Church, & De Oliveira, 2014; Mehrotra et al., 2016).

From these case studies, we can see that large quantities of notifications can cause many responses from users, one of which including the desensitization of notifications. This will be analyzed in the next section.

Analysis

Notifications as a form of marketing have increased the desensitization of users to notifications, this is the opposite of the initial purpose of notifications. Notifications initially were created as a way to get immediate response from users, however, the change of notifications to being a form of communication and marketing is also followed by an increased quantity of notifications. The increased quantity of notifications can create a counterproductive result where notifications no longer create a feeling for users to feel obligated to respond immediately. Instead, users can start to feel overwhelmed by the large amount of notifications, causing them to be completely insensitive when receiving a notification.

The insensitivity to notifications may result in users not being able to receive real time updates for information that is important to them. Insensitivity to notifications can be due to users not changing their default notifications settings for all of the applications that they download for many reasons, some of which including the user not caring if they receive notifications, the user not knowing how to change the notification setting, the application not having enough customizability for what type of notifications to receive and many other possible reasons that a user may be receiving a large number of notifications. This occurrence may occur due to users being worried that they will be missing out on important information if they turn off notifications.

For users that may not be insensitive to notifications that they receive, the amount of time between the event of the notification occurring and the time the user receives the notification is important to reaching the purpose of the notification. Certain notifications may be time sensitive, so having notifications sent to users in a timely manner is key to ensuring the information is delivered. However, there can also be cases where the delay in notification sending is not crucial, instead it's about delivering notifications to users when appropriate. Such as notifications that remind users of an important event or messaging between people about an emergency are all events that are crucial for immediate or near immediate response times.

In some other cases sending notifications when users are idle can be a better option to get the user interacted with the content. And sending notifications while the user is completing less complex tasks can prevent users from being deterred about the notification sender or content of the notification. Although, this could also cause a large amount of non time-urgent notifications to be sent right when the user is idle causing information overload for the user. Currently, Apple already has mechanisms they use to help with delivering notifications at a time that is more appropriate to get the user more likely to be engaged with the application. Apple requires developers to choose a level of priority for the notification, which is then used for Apple to determine if the given notification should be sent in a timely manner or if it can be delayed to an appropriate time to increase the likelihood of user retention and interactivity (Stringfellow, 2023).

Conclusion

In conclusion, the evolution of notifications to a form of marketing has increased the user's insensitivity to notifications, due to overload of information from large quantities of notifications. The overflow of notifications may cause users to be insensitive to content and loses the effectiveness of real-time notifications. Through optimizing the notification design in form such as balancing timely delivery and relevant content, developers can improve the user experience to help improve the effectiveness of push notifications.

References

Alireza Sahami Shirazi, Niels Henze, Tilman Dingler, Martin Pielot, Dominik Weber, and Albrecht Schmidt. 2014. Large-scale assessment of mobile notifications. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. ACM, Toronto Ontario Canada. Retrieved from https://doi.org/10.1145/2556288.2557189

Goode, L. (2019.). History of Notifications. *Wired*. Retrieved from https://www.wired.com/story/history-of-notifications/

Google Ads Help. (n.d.). About Google Ads and Google Marketing Platform integration. Retrieved from https://support.google.com/google-ads/answer/2615875?hl=en

Keitaro Team. (2023, July 3). Marketing Matters: The Evolution of Push Notifications. Keitaro Blog. Retrieved from https://blog.keitaro.io/en/marketing-matters-the-evolution-of-push-notifications/

Mehrotra, A., Pejovic, V., Vermeulen, J., Hendley, R., & Musolesi, M. (2016). My phone and me: Understanding people's receptivity to mobile notifications. Proceedings of the 2016 CHI conference on human factors in computing systems. Retrieved from https://doi.org/10.1145/2858036.2858566

Pielot, M., Church, K., & De Oliveira, R. (2014). An in-situ study of mobile phone notifications. Proceedings of the 16th international conference on human-computer interaction with mobile devices and services. Retrieved from https://dl.acm.org/doi/pdf/10.1145/2628363.2628364?casa_token=eFZqJeRIL4oAAAAA:3NqeQZtP_JLGmilfB7EoYaVnnLqYnn0UcNmM05ePDf_-kemJzh9negQjiTOXB7PvgnRo7OIIWdmqxw

Scal-e. (2023, September 11). Push Notifications: The Future of Marketing Campaigns. Retrieved from https://scal-e.com/push-notifications-the-future-of-marketing-campaigns/

Stringfellow, A. (2023, December 6). What is Apple Push Notification Service (APNs)? MagicBell Blog. Retrieved from https://www.magicbell.com/blog/what-is-apple-push-notification-service-apns

X2 Private Limited. (2022, May 20). Push Notifications Marketing: The Future of Advertising. Truepush Blog. Retrieved from https://www.truepush.com/blog/push-notifications-marketing-the-future-of-advertising/