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NotificationHub

A SOLUTION FOR MANAGING SMARTPHONE NOTIFICATION OVERLOAD
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PROBLEM

Bzzz! Bzzz! You look up from your careful studying only to see the background of your phone light up again as a box appears on the screen displaying yet another notification. You decide to take a quick break and end up spending 20 minutes scrolling through the various newsfeeds of whatever app alerted you. Sound familiar? This scenario is all too common for the average American in a world where 77% of the people in the US own smartphones and the average user checks their phone 50 times a day, spending around 4.5 hours on their device (Larry, 2017). Force of habit and behavior-based reinforcement often compels users to check their phones for every single notification, contributing to possibly debilitating behaviors such as constant distraction from productivity (Cutino, 2017).

There are readily available solutions to this notification problem, like “Do Not Disturb” mode, available on every iPhone, or the ability to edit how one receives notifications for each individual app (with the ability to completely disable them). However, there are many people who do not take advantage of these features either at all or at times when they would be most needed. Out of a sample of 35 people (mostly UW Informatics Students) surveyed on the use of these features 51.4% said that they do not use the “Do Not Disturb” feature even though they know it is available. Of those who said they do use it, many only did so when sleeping to prevent notifications from waking them up. Of the 35 students surveyed only 10 of them stated that they actually edited settings for specific apps to opt out of receiving notifications. These figures were obtained through an online Facebook Survey distributed to students via the IUGA Page. This data suggests that while many smartphone users surveyed know that features to help curb bad habits involving notifications exist, the majority of them do not choose to use these features.

This research suggested the need for a solution that informs users of their notification habits and activity to guide them to make informed decisions regarding the already available notification limiting tools. This kind of approach is shown to work through studies like one done by researcher Martin Pielot, where users went without notifications on their phone for 24 hours. After seeing how much notifications impacted them, approximately 33% of students involved began using notification limiting tools such as “Do Not Disturb” when the study concluded (Pielot, 2016). By identifying that there is a problem with mobile phone use, especially during times when one planned on being focused on something else, we are hoping to push users to action in making informed decisions about how they handle their notifications.

SOLUTION

To solve this problem, we have created an application that is installed as part of the basic iOS features and is readily installed on every iPhone. This “NotificationHub” collects and presents information about the notifications received by a user and the impact those notifications have on that user’s life. By arming users with knowledge regarding their notification activity and habits we are hoping to empower them to take action, which the application will also accommodate. Users can easily change application-specific notification settings or enable do not disturb, all from within NotificationHub.

By using both fear-based statistics (numbers that are meant to surprise/scare the user) and simple visual data, we are putting all the information needed to solve the notification problem at the fingertips of users. In doing this, NotificationHub also serves as a guide that allows users to easily change notification settings so they don’t have to go wading through the menus within settings to do so.

Building NotificationHub as an integrated, native iOS application allows for a familiar look-and-feel and convention-based design. When possible, the application's design adheres to conventional and established iOS standards by using default color schemes, layouts and icon settings. This native-design approach also enables deeper integration with the iOS ecosystem. For example, NotificationHub can make edits to the lock screen UI, take information from other iOS applications like contacts, and sync events with user calendars. These important features connect user notification habits with other widely used parts of their phone and truly make using the app a seamless experience.

The functionality and of each screen of NotificationHub is explained in detail below, along with explanations for design decisions, and serves as a blueprint for the potential development of a production-ready version.

Activity Tracking Methodology

NotificationHub defines and tracks a usage session per application using the following method: If a user opens the application for which they've received a notification within ten seconds of receiving that notification, which allows for any security login steps, NotificationHub begins tracking the length of that usage session and continues to do so until the user is no longer using the application for five concurrent seconds. The activation of secondary applications opened through the use of the primary application will not end the tracking of a usage session.

Locked Screen – Incoming Notification

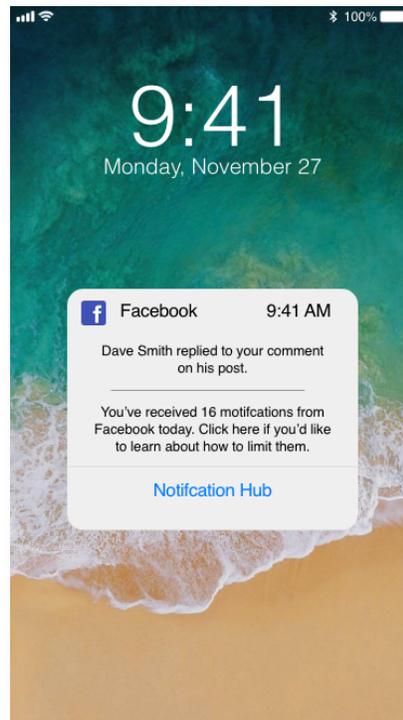


Figure 1

Once users reach the threshold of notifications for a single application in one 24-hour cycle, a prompt, as shown in figure 1, is added to the next notification they receive from that application to open NotificationHub. The threshold varies, as it is determined by considering the average number of notifications received by all other users of that application. Thus, NotificationHub is addressing those users who are receiving an above average number of notifications.

This feature allows NotificationHub to reach users who may be unaware of the application and by including the prompt only when the notification threshold has been reached, the application respects the available real-estate of the user's lock screen and notification as well as their tolerance for repeated calls-to-action.

Interactions

- Notification Hub link - After press, if phone has a passcode, users are prompted to sign in. After signing in, users are taken to the Main screen (figure 2) for the specific application.

Main Screen

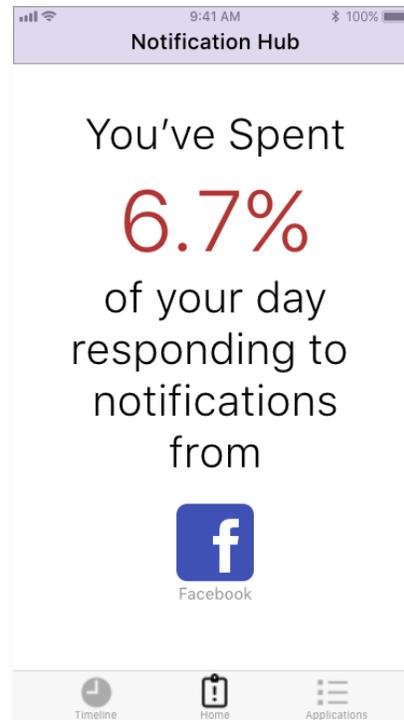


Figure 2

The Main Screen (figure 2) is the first screen users are presented with when they visit NotificationHub by opening the application itself from within iOS. This screen highlights the application that has been used for the most total amount of time among all applications used for that day as the result of responding to or acting on a notification. The information on this screen is dynamic and will change as the user's notification and usage activity fluctuates throughout the day.

“Acting on a notification” is defined for the sake of NotificationHub as either:

1. Opening an application from a notification within 5 seconds of receiving it, or
2. Opening the application from any of the iOS home screens within 5 seconds of receiving a notification for that application.

Interactions

- Application Icon - Clicking the icon for the application responsible for the largest percentage of time takes the user to the Application Closer Look Screen (figure 6).
- Timeline Icon - Takes the user to the Timeline Screen.
- Applications Icon - Takes the user to the Applications Screen.

Main Screen Color Scale Algorithm

The color scale for the percentage above (6.7%) creates a positive or negative association for the user regarding how much time they spend on a given application – red is negative while green is positive. According to a study by professor Larry D. Rosen of California State University, the average smartphone user spends approximately 18.75% of their day using their device (Larry, 2017). If any significant portion of that time was spent using one application it will be reflected on this page, hopefully serving as a surprising and actionable statistic to the user. Within the field of psychology, various shades of red are associated with caution, with brighter shades of red being more eye catching. Greens on the other hand are used to provide relaxation so users feel like they are doing something right (Avitons, 2017). Based on this research, NotificationHub will use a color scale with brighter greens showing “good notification behavior,” darker greens, blacks, and dark reds to show more “neutral behavior” and bright eye-catching reds to warn the users that their notification behavior has picked out as alarming by NotificationHub.

The application will determine the severity and range of colors by using an algorithm that compares the user statistic for a given app to an average taken from every iPhone user who has that application installed. Those who are at average will be shown black text while those under/over it will get a different hue of green/red for each 5% (in terms of minutes) variation they have from the average. A 10% variation from average will be considered so that the color will change to influence the user in a greater/lesser way depending on how much more/less than average they use their phone.

Applications Screen

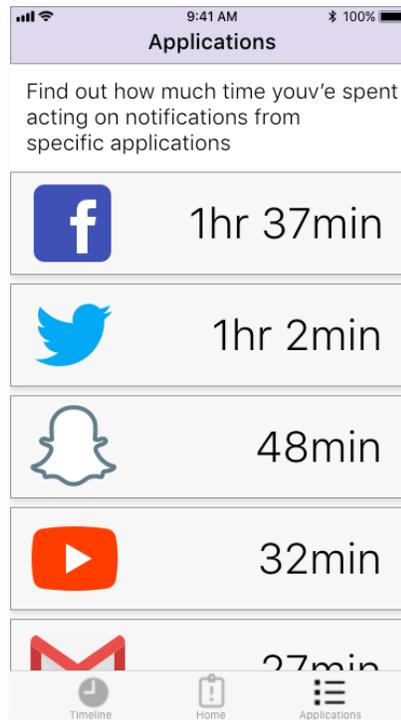


Figure 3

The Applications screen (figure 3) presents usage information per application and describes how much total time in a 24-hour period has been spent using an application after acting on a notification. Applications are sorted from highest to lowest usage and each application icon is an active link to its respective Application Closer Look (figure 5) screen.

By having immediate access to total daily notification activity per application, users can make quick decisions that address future notification activity. For example, users may learn that one particular application is responsible for the bulk of their notifications for the day so they may decide to take steps to limit that application's notification activity.

Interactions

- Application List - Users can scroll through a list of applications if they exceed the height of the screen.
- Application Icons - Clicking each application icon takes the user to its respective Application Closer Look screen.
- Timeline icon - Takes the user to the Timeline Screen.
- Main icon - Takes the user to the Main Screen.

Timeline Screen

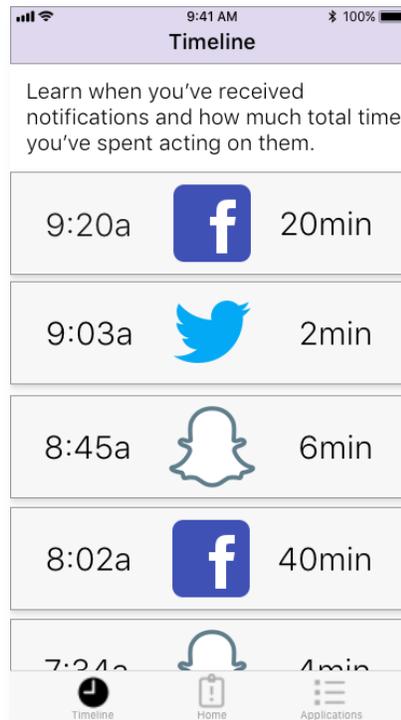


Figure 4

The Timeline (figure 4) Screen presents usage information in a time-based format, highlighting when a notification was received and how much total time has been spent in an application after acting on those notifications. Information is presented in descending order with the latest activity at the top and oldest at the bottom. Each application icon is an active link to its respective Application Closer Look screen.

By presenting notification and app usage in this format, users can quickly see a live representation of their notification activity and identify problematic trends as well as get instant feedback about how long a particular activity session lasted in their activity history. Surfacing this information could challenge users to reconcile their perceptions of how long they were engaged in a particular usage session. For example, a user may have believed they didn't use Facebook for very long during an earlier session, but a review of the Timeline reveals that they spent twice as long as they initially perceived. This realization could potentially drive action and behavior change.

Interactions

- Application Icons - Clicking each application icon takes the user to its respective Application Closer Look screen.
- Applications icon - Takes the user to the Applications Screen.
- Main icon - Takes the user to the Main Screen.

Application Closer Look Screen

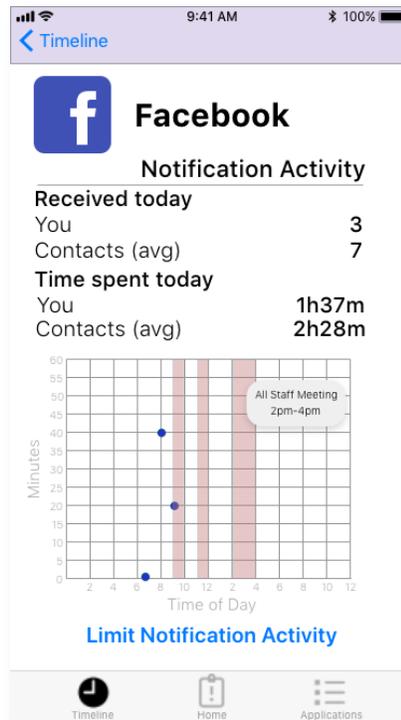


Figure 5

The Application Closer Look screen (figure 5) provides deep notification information about the specific application including:

- The number of notifications the user has received for the current day.
- The average number of notifications the user's contacts have received. Applicable contacts would include those using iOS and have consented to sharing this data with Apple during initial device setup.
- The amount of time spent in the application after receiving a notification for the day thus far.
- The average amount of time spent by the user's contacts.
- A graph illustrating when notifications were received and how long a user used the application afterwards.
 - X-axis: Time of day when notification was received.
 - Y-axis: Minutes spent using the application.
 - Highlights: Scheduled time drawn from the user's calendaring app.

The level of detail about notification activity provided by this screen arms users with granular detail about their behavior and informs decisions about potentially limiting notification activity. For example, users may determine that the bulk of their notifications activity for a particular application occurs during specific hours. This awareness could drive behavior change, such as scheduling engaging Do-Not-Disturb during those hours.

Interactions

- < (previous screen) - Returns user to originating screen (Timeline, Main or Applications Screen)
- Timeline - Takes the user to the Timeline Screen.
- Main icon - Takes the user to the Main Screen.
- Applications icon - Takes the user to the Applications Screen.
- Limit Notifications - Takes user to Limit Notifications Screen.
- Red Highlight bars - When tapped, produce a modal with limited information, taken from a user's default calendaring application, for scheduled meetings, including:
 - Meeting title
 - Meeting start time
 - Meeting end time

Limit Notifications Screen

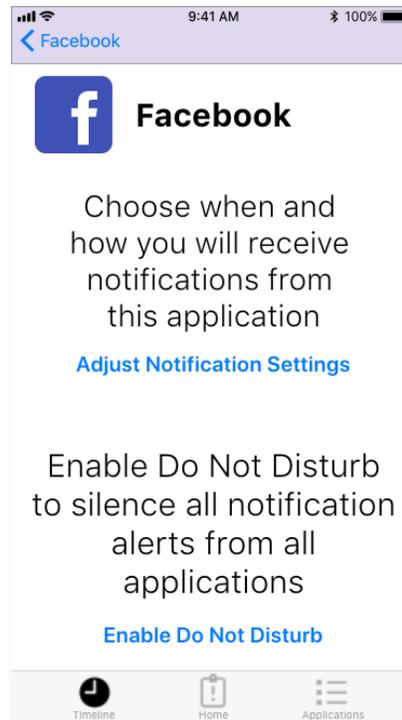


Figure 6

The Limit Notifications screen (figure 6), accessed when a user follows the Limit Notification Activity link from the Application Closer Look screen (figure 5) presents users with two options:

- **Adjust Notification Settings** – Takes the user to the iOS notification setting screen for the application, allowing the user to adjust the available granular settings.
- **Enable Do Not Disturb** – Immediately enables the iOS Do Not Disturb function which will silence notification alert activity but not the notifications themselves.

This screen surfaces and consolidates access to the remedies available to users within iOS to address their notification activity.

Interactions

- < (previous screen) - Returns user to originating Application Closer Look Screen.
- Timeline - Takes the user to the Timeline Screen.
- Main icon - Takes the user to the Main Screen.
- Applications icon - Takes the user to the Applications Screen.
- Adjust Notification Settings - Takes users to the application-specific notification settings in iOS
- Enable Do Not Disturb - Engages the default iOS Do Not Disturb setting for the user's device. After activation, language becomes "Disable Do Not Disturb"

EVALUATION

To evaluate NotificationHub as a valid solution to the identified problem, we spoke with two representative users about the application. This entailed introducing the problem to the users and then allowing them to use NotificationHub and provide feedback.

The first user was a little confused by some of the visual aspects of the design, but she generally understood the ideas we were trying to convey. She said that she liked the design as a “knowledge-bank” that allows her to learn about time spent on notifications and her habits. However, she did say that having a more informative load-up screen would be helpful and that she feels like there should be more present on that screen. This user also suggested the Timeline and Applications screens could use some information about what they were illustrating. We agreed, and implemented this feedback into our design.

Another representative user noted the design gave good information about notification habits, but it made him want more information regarding phone usage overall. For example, after seeing time spent on apps based on notifications he was wondering if we had a way to see time spent overall.

LIMITATIONS

NotificationHub isn’t effective for engaging users who have a completely different view on notifications than the app promotes. Those who are not willing to admit they have a notification problem (even if they do) will likely just disable NotificationHub without giving it a chance because to them it addresses something that isn’t seen as a problem. Similarly, this solution won’t be of use to those who receive notifications but do not act on them. NotificationHub would not address or track this distraction as the users did not engage with the notification. This solution would also be limited when it comes to addressing users who do not actually connect their phone use to notifications and wholly believe that their time spent using their phone is 100% of their own will.

Users who are not interested in taking an information based approach to solving their notification problems will also likely find NotificationHub limiting. The intent of this solution is to inspire users to make changes by comparing them to their peers and by providing them with statistics to interpret. If a user is not inspired to take action by either of these things, NotificationHub will fail to address their problem.

NotificationHub will be able to handle some disabilities, like deafness (it has no sound content) and blindness (Apple has settings to help with this). However, this solution is less effective for color-blind users. Because NotificationHub relies heavily on a green-red color scale that is said to impact user emotion in order to incentivize them, usage data as currently represented by NotificationHub may not have the desired effect.

Another group NotificationHub may not fully solve for is younger users. More and more children are receiving smartphones at earlier ages and NotificationHub and its features may be somewhat lost on them. Younger children may not realize why these statistics are important and also may be unable to properly interpret them as their ability to understand statistical data is limited or not yet developed.

NotificationHub also fails when it comes to reaching out to users who do not own an iPhone because it has been designed as a default Apple Application.

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