Effectiveness of Alerts on Smart and Wearable Devices

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Abstract

Notifications are one of the key elements in smart devices. With the increase in smart and wearable devices the notifications generated by them are also increasing. A user receives these notifications throughout the day and due to the use of various smart devices, they go on multiplying. Do we really need so many alerts and notifications? An online survey was conducted to investigate the notifications generated by various apps across these devices and the user's perception of its importance. This study evaluates the effectiveness of these alerts on the day to day life of a human being and gives recommendations to improve it.

1. Introduction

Over the last few years, smart devices including Smartphones, Tablets, Smartwatches, Smart Health Devices, Smart TVs, Smart Speakers, Gaming Consoles, Home Automation and Car Infotainment systems have become an integral part of the household. They have gained a large user base and popularity. These devices provide multiple services like email, news, games, calendar, and text messaging, among others. This allows users to stay in touch and receive updates including notifications wherever they are. These notifications are designed to provide users with valuable and useful information but with an increase in the usage of smart devices, the notifications triggered by one application are being propagated to all the devices that use this application. This increase in notifications can not only reduce user experience but can also cause distractions to the user.

Even though people have started using smart devices daily it is not clear if they appreciate the notifications that they receive on their devices. Previ-

ously authors have studied the effects of notifications on PCs and Smartphones but this paper attempts to study the notifications of smart and wearable devices from people's perspective and make recommendations to improve the user experience. To evaluate the user's satisfaction a survey was conducted in February 2019. A total of 105 responses were recorded from users who own and use at least one of these devices. The survey was designed to assess the user's familiarity with these devices and the types of applications they would prefer receiving the notifications from.

2. Related Work

We live in an era where being online is not only consideration but is also expected. A major consequence for this is addiction and dependability on smart devices. Smart devices use various forms of alerts including auditory cues, vibrations, and haptic alerts to notify users. These notifications have been designed intelligently considering the user's needs and problems. In the previous works authors [1, 2] have stated that the notifications on devices depend on the applications. Smartphones are considered the most popular device among the people to stay updated on appointments, emails and software updates. These notifications are perceived differently by people according to the situation and the devices that they receive them. In a study authors found that users get disturbed when they receive too many notifications from instant messaging apps on Smartphone [3, 4] and employees are much resourceful when they disable email notifications at the workplace [5].

In a different study, the authors [6] have also evaluated the differences between Smartphones and Smart TVs. It is mainly focused on the privacy concerns arising from using TVs to display notifications as they are used by several people and privacy can be a serious concern. Another investigation on Smartwatch revealed that these devices are used frequently in brief intervals during the day [7]. Weber et al. [8] in their study found that there is a necessity to manage the distributions of notifications across user's devices. Such a system should take into consideration such as when the notification should be delivered and displayed optimally.

To summarize prior research on notifications and alerts focused only on particular type of devices. What is lacking is how these notifications should be designed in a multi-device environment keeping users in mind. In the

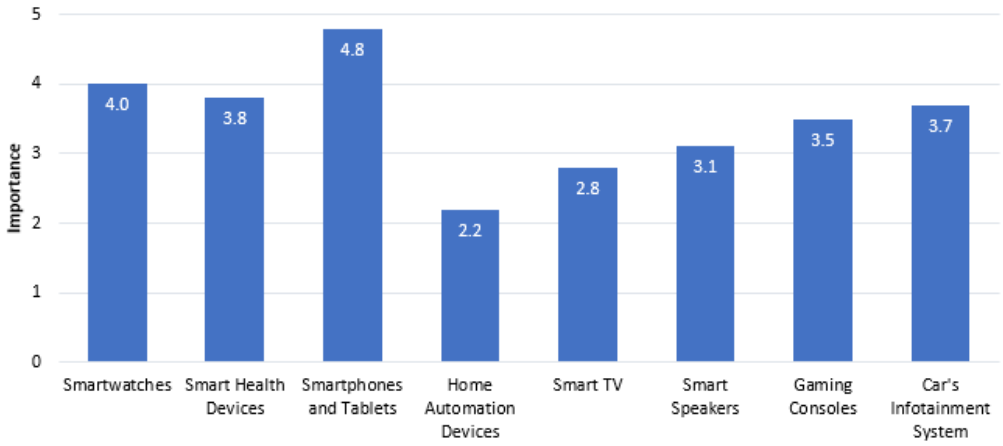


Figure 1: Familiarity with Devices (n=115)

future Internet of Things (IoT) based devices like Smart Bulbs, Home Hubs and pervasive displays will also be used to alert the users and it is important to create an effective ecosystem for these.

3. Evaluation

In order to study the nature and effect of alerts on smart devices, a survey was conducted through emails and social media in February 2019. The aim of the survey was to learn which notifications the users wanted to receive and on what devices.

The survey was designed in three sections. In the first section, the demographics of the users were collected. In the second section the users were asked to enter their familiarity with Smartphones, Tablets, Smart Health Devices, Smartwatches, Home Automation Devices, Smart TVs, Smart Speakers, Gaming Consoles and Car's Infotainment System on a five-point scale (1 = Not Familiar and 5 = Used frequently). In the third section the users were asked to enter the importance of notifications in the above-mentioned devices on a five-point scale (1 = Least Important and 5 = Very Important). They were then asked to enter the preference of alerts they would like to receive for each type of app on a particular device (1 = Least Important and 5 = Very Important). The apps were grouped into eight different categories

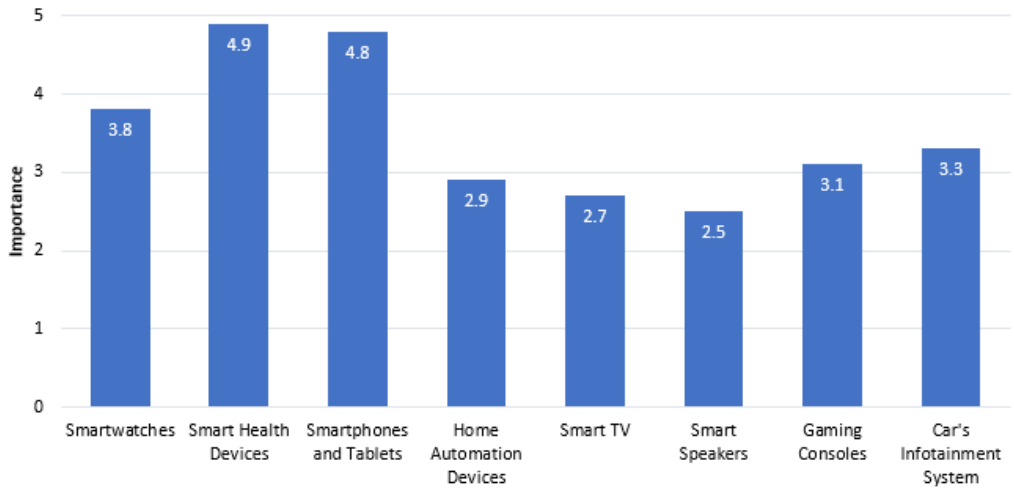


Figure 2: Importance of Notifications (n=115)

Audio and Text Messenger, Health Apps, Email, Social Media, Calendar, Games, Home Automation and System.

4. Results

4.1. Participants

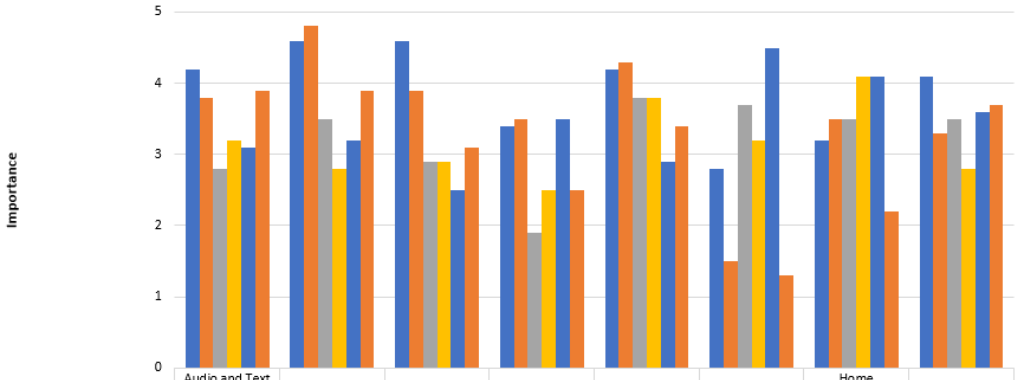
In total 119 responses were recorded in this survey and after removing the duplicate entries it resulted in 115 total responses - 72 Male and 43 Female. The average age was 23 years and all the users owned at least one smart device.

4.2. Familiarity of Devices

As shown in Figure 1, the users were highly familiar with Smartphones and Tablets (M=4.8) followed by Smartwatches (M=4.0) and Smart Health Device (M=3.8). They were least familiar with Home Automation Devices (M=2.2) and Smart TVs (M=2.8) which can be attributed to their less market penetration and popularity.

4.3. Importance of Notifications

The users were asked to rate the importance of notifications that they receive from a particular device. Figure 2 shows the shows the responses for



	Audio and Text Messenger	Health Apps	Email	Social Media	Calendar	Games	Home Automation	System
Smartphones and Tablets	4.2	4.6	4.6	3.4	4.2	2.8	3.2	4.1
Smartwatches	3.8	4.8	3.9	3.5	4.3	1.5	3.5	3.3
Smart TVs	2.8	3.5	2.9	1.9	3.8	3.7	3.5	3.5
Smart Speakers	3.2	2.8	2.9	2.5	3.8	3.2	4.1	2.8
Gaming Consoles	3.1	3.2	2.5	3.5	2.9	4.5	4.1	3.6
Car Infotainment System	3.9	3.9	3.1	2.5	3.4	1.3	2.2	3.7

Figure 3: Importance of Notifications - Devices vs Apps

each device. In this question, the respondents were asked to assume that they own all these devices. It can be seen that the users favored receiving notifications on Smart Health Devices (M=4.9) and Smartphones/Tablets (M=4.8). However, they were less favorable to receive notifications on Smart TVs (M=2.7) and Speakers (M=2.5).

4.4. App Notifications and its Importance

The applications were classified into eight groups and the participants were asked to consider the importance of each category of apps across six types of devices. Comparing the notifications on different devices as shown in Figure 3, it can be seen that Health apps (M=4.6) and Emails (M=4.6) were considered the most important notifications in a Smartphone followed by Calendar (M=4.2). Whereas on a Smartwatch, people preferred to receive notifications from Health Apps (M=4.8) and Calendar (M=4.3) followed by Email (M=3.9) which is a similar trend to that of a Smartphone. On Smart TVs people preferred to receive notifications from Calendar (M=3.8) and Games (M=3.7) followed by System (M=3.5) and Home Automation related apps (M=3.5). However, on Smart Speakers people considered notifications from Home Automation (M=4.1) and Calendar apps (M=3.8) as Important whereas in gaming consoles the notifications from Games (M=4.5) and Home

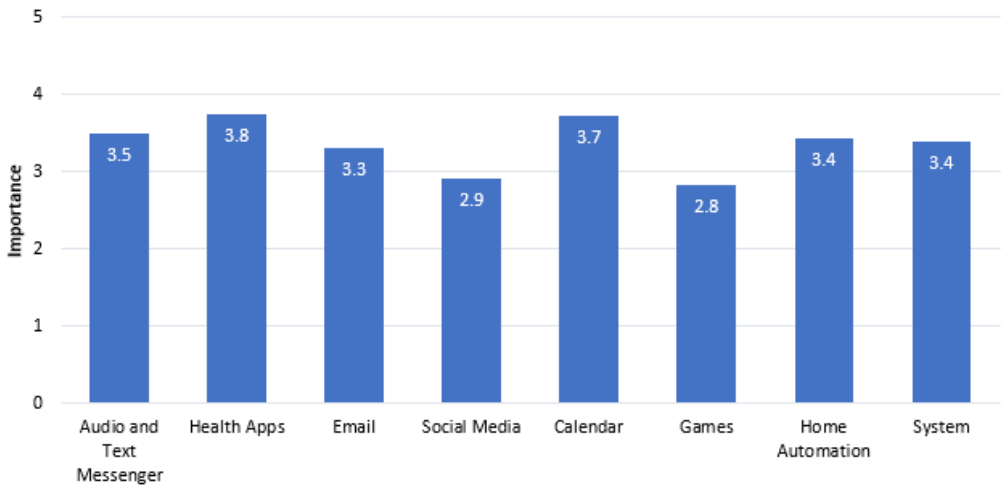


Figure 4: Averages across categories (n=115)

Automation Systems (M=4.1) as important. Finally, it can be seen that there is not much variation in the preference of apps for Car Infotainment System. In this category, Audio and Text Messenger (M=3.9) and Health Apps (M=3.9) were considered most important followed by System (M=3.7) and Calendar related apps (M=3.4).

On considering the average of preferred notifications across all the devices it is found that alerts from Health apps (M=3.8) and Calendars (M=3.7) were considered most important followed by Audio and Text Messenger (M=3.5). However, people were less keen on receiving notifications from Games (M=2.8) and Social Media (M=2.9) in Smart Devices which can be seen in Figure 4.

5. Conclusion

According to the results obtained by the study, we are able to determine that the interplay of both apps and devices determine the importance of notifications. It is evident that people prefer to receive notifications from Health Apps and Calendars irrespective of the device and give the least preference to notifications from Games and Social Media. As far as the devices are concerned Smartphones and Smart Health Devices are considered important for notifications whereas Smart TVs and Smart Speakers are least preferred.

Device manufacturers should take these results into consideration and create a notification delivery system that is more personalized to the users. A notification opt-out approach should be implemented across all the devices and the notifications should be designed individually for every device instead of routing it through all the devices. In the case of messenger apps, the notifications can be grouped as per the contact type and various alert sounds can also be devised for different kinds of notifications. Considering these changes would reduce disruptions and also improve the overall user experience over the smart devices.

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