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Evaluation of Push Notifications for Social Media Applications

EMMA FAHLMAN, THOMAS MEJTOFT & HELEN CRIPPS

Abstract The growth of social media has impacted on people's everyday life, precipitating the development of a new set of guidelines for designing applications (apps), creating heightened user engagement without crossing the line to frustration. This study focuses on how push notifications from social media apps should be designed in order to keep the user intrigued and returning to the app, without annoying the user to the point where they turn the push notifications off. The exponential growth in the usage of social media has emphasised the importance of designing apps with a user-centred functionality. The study used a combination of a survey questionnaire and a qualitative perception study, with the results collected as both data and extracts from interviews. This study identified that a high frequency of notifications from social media apps has led to resentment by users against pushes notifications in general. The app-user relationship is cemented from the beginning of the experience and the action the user takes in relation to notifications depends on their perception of the senders' intentions. Younger users' actions are also predominately driven by the phenomena Fear of Missing Out.

Keywords: • Social media • Push notification • Users perceptions •

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1 Introduction

Nowadays a majority of applications (apps) for smartphones use push notifications as a way to communicate to the user and create greater engagement (Kim and Baek, 2018). For app developers, notifications are an effective way to interact with the users in different ways depending on the nature of your notification. However, when a notification is sent out to a user, it is delivered directly with without considering the users situation or psychological state (Okoshi et. al., 2016). The notification could be perceived as a distraction or interruption, potentially causing inattention and frustration for the recipient, even if the content of the notification is not demanding at all (Kushlev, Proulx and Dunn, 2016). Despite the frustration, a user might respond subconscious to an interruption due to sound or vibrations in association with the notification, and leading them into their smartphone to explore which application that sent the notification (Turner, Allen and Whitaker, 2015). If the main goal of the notification were to get the users attention, it would be beneficial to create an interrupting notification that uses audio, vibration and an urgent formulation of the text. Where the aim of engaging the user fails is when the user decides to turn off the notification (which can be made in most application settings) in their smartphone, and the application loses the ability to communicate with the user (Pielot and Rello, 2017).

There are many factors to take into account when dealing with users' actions in relation to notifications in real life situations. The app designer must keep the user intrigued and drawn back into the application, without crossing the line where interest turns into frustration. As Buttrick, Linehan and Kirman (2014) suggest the interaction between people and contemporary technology could be perceived as a submissive (user)-dominant (technology) relationship. They also state that technology is ostensibly developed to support people in their daily lives, but in recent years technology could be viewed as more demanding, rather than supportive (Buttrick, Linehan and Kirman, 2014; Kushlev, Proulx and Dunn, 2017). Turner, Allen and Whitaker (2017) suggest with the ubiquity of notifications comes increased cognitive load for the user. Notifications have been used extensively in marketing particular in retail with the rise of geo-location technology (Faulds *et al.*, 2018; Kim and Baek, 2018) however rather than guiding the user the notifications are seen as intrusive (Karapanos, Teixeira and Gouveia, 2016). If designers start out from the assumption that contemporary technology is a demanding force in the human-computer relationship, then they could implement the philosophy when designing a notification (Saltan, 2014; Turner, Allen and Whitaker, 2015).

This study will explore how the app-user interaction can be structured to benefit both the developer and the user. The research seeks to identify how to optimise the notification without annoying the user to the point where they turn off the push functions. The study will identify the most suitable way of using push notification for social media apps so the user cannot resist opening them.

2 Background

How the human-computer relationship works when dealing with push notifications has been investigated in prior studies conducted in the field (e.g. An, Woo, Lee and Yeom, 2016; Elslander and Tanaka, 2013; Turner, Allen and Whitaker, 2015). The usage patterns on social media today are also an important factor to take into account for this study when dealing with the users' behaviour and interaction with smartphones (Fox and Mooreland, 2015).

2.1 Daily notifications

An extensive study done by Elslander and Tanaka (2013) at Kyoto University, Japan, provided some interesting results about the use and perception of mobile notifications. They handed out a survey containing various questions about notifications and received 9900 answers. From the data analysis some parameters distinguished themselves. According to their study, roughly half of smartphone users receive less than 10 notifications per day. The difference is that younger smartphone users (aged below 25) and female respondents tend to get notified on more occasions than older users and male respondents. Furthermore, there is a visible difference depending to which operating system (OS) the users smartphone has, 69% of Android users gets more than 10 notification per day while only 45% of iOS users do.

2.2 Interaction with notifications

Besides looking into the amount of notifications users receive, it is important to analyse how the users interacts with them to get a better insight of their behaviour. Fox and Mooreland (2015) found that notification such as automated Birthday updates from Facebook made users feel obligated and pressured to post on their friend's timeline. This sense of and cognitive loaded in response to notifications has been identified in previous research (e.g. Okoshi, et al. 2015; [Westermann](#), [Möller and Wechsung](#), 2015).

Another parameter for measuring notification was suggested in Elslander and Tanakas' (2013) that study showed that nearly all respondents admit to activating their phones' screen regularly in order to check for missed notifications. An et al., (2015) found that multiple notification in quick succession lead users to "lose" and disconnect from notifications. More importantly, the frequency of interaction differed between gender and age in their study. The respondents aged under 25 claimed to check their phone at least once an hour, while respondents aged over 25 stated to only do so sporadically. Furthermore, almost half of the female users check at least once an hour compared to only one in three male users. Android users also check their phone more frequently for notifications they missed out on than iOS users. Half of all Android users checked their phone at least hourly, compared to only 16% of iOS users (Elslander and Tanakas, 2013).

2.3 Difference between operating systems

The difference in the users' behaviour between operating systems (OS) can be explained by looking into how the different OS handles and displays the notifications to the user. The two most common systems are Android that uses the notification drawer and iOS that uses the notification centre (Li, 2017). Both systems have an associated workflow that differs between the two platforms. What can be seen is that notifications are much more prominent on the Android as they are repeatedly appearing on the locked screen and sticky icons are placed on the home screen, giving the user a frequent reminder to open them. Android also allows third party applications to submit a customized view object in the notification view (Xu and Zhu, 2012). With iOS, being less able to be customized, it only allows submitting text content. Also, the iOS user is only reminded of new notifications once and after they have appeared on the screen the notifications hides in the notification centre (Li, 2017). The pull-down notification centre that holds an overview of the current notifications on the phone was initially released on the Android OS. In 2011, Apple introduced a very similar looking feature with iOS 5 (Li, 2017). Both notification centres have been evolving since by adding new functionality like custom icons, images and action buttons with the aim of drawing the user back into the apps.

2.4 Use of Social Media

Social media platforms have in the last couple of years become a central part of people's everyday life and studies have shown that nearly two-thirds of American adults used social network sites according to Perrin (2015). The rise of social media has affected areas divers areas of peoples' lives including as work, politics and political deliberation. Social media has even changed the way people get and share information and their communication patterns around the globe about civic life, health, dating and well-being (Perrin, 2015). The study found a prominent correlation between age and the level of social media use. Since the introduction of social media young adults in the ages 18 to 29 have always been the most likely users. In 2015, 90% of young adults in America used social media compared to 12% in 2005 (Perrin, 2015). Also, among the users aged 30-49 there has been a 69-percentage point increase in use during the same time period.

During 2017, 81% of the Swedish population, with access to the Internet, visited some kind of social media network site (Davidsson and Thoresson, 2017). This number has been steadily increasing ever since the concept of social media was established (Davidsson and Thoresson, 2017; Findahl, 2011). Especially interesting is it to see how fast the average ages of the regular social media user has dropped during the past years in. Currently, there are no signs on an overall decrease in the use of social media platforms, which highlights the importance of designing apps with user centred functionality (e.g. Nielsen, 2012).

2.5 Fear of Missing Out

The growing impact of social media on people's everyday life has promoted a development of a new set of rules and guidelines when designing mobile applications. The pace of life online and offline is becoming increasingly intertwined and has led to an up rise of the phenomenon termed Fear of Missing Out (FoMO) (Kushlev, Proulx and Dunn, 2016). In a study done by Przybylski et al. (2013, p. 1841), the phenomena is defined as a "pervasive apprehension that others might be having rewarding experiences from which one is absent"

". People with FoMO tend to be present online more, especially on social media, and this can lead to people experiencing low levels of overall life satisfaction and a greater sense of isolation (Kushlev, Proulx and Dunn, 2017). Previous research found a correlation between FoMO and young adults who tended to use Facebook more often immediately after waking up, before going to sleep, and were more likely to give into the temptation of composing and checking text messages and emails while operating motor vehicles (Przybylski et al. 2013). This phenomena can also be connected to the study by Elslander and Tanaka (2013), that showed nearly all respondents admit to activating their phones' screen regularly in order to check for missed notifications.

With the rise in social media usage and increase in notifications received by users this research seeks to identify the design parameters for application notifications that would engage users without frustrating or alienating them.

3 Method

This study is based on a combination of a survey-based questionnaire and a qualitative perception study, which were undertaken during late 2017. The survey used was based by prior studies in the field of push notifications and social media that gather quantitative data about the users' preferences, while the test is to study people's actions and thoughts about push notifications (Elslander and Tanaka, 2013; Perrin, 2015). The survey was limited to people who has a smartphone since that is a requirement for being able to receive push notifications from social media applications.

3.1 Survey

The first phase in data collection uses an Internet based survey that was distributed, via Google Forms, to a sample of young adults due to their significant use of social media (Perrin, 2015). The survey included demographic questions focusing on age and gender, and technical questions, such as operating system (OS) of their smartphone. These three factors can be useful in the analysis of the received data. The structural questions of the survey investigated the app-user relationship and their personal preferences towards intriguing push notifications.

Besides the three important factors of age, gender and OS, further categories of questions are included in the survey according to the users' notification preferences. The six defined parameters are based on Elslander and Tanaka's (2013) survey aimed to distinguish the most significant questions to receive valid responses. The parameters for this survey are presented in Table 1.

Table 1: Notification Parameters

Notification Characteristic	Measure
Amount	For how many social media apps have you enabled push notifications?
Frequency	How often do you (in general) receive notifications from social media?
Importance	How important are social media notifications to you?
Action	What action do you generally take upon receiving a notification from social media?
Behaviour	Which notification would you open?
Preferences	Give an example of a push notification that makes you happy/annoyed.

3.2 Perception study

In addition to the survey, a high fidelity (hi-fi) prototype that simulates push notifications was created and displayed to the test persons who agreed to participate. The prototype is very basic, only focusing on the notifications and present two options, "open" or "cancel". The simulated push notification contained a text message written in a different character or tone. Either the text had a demanding and forcing tone, or it was mainly of an informative and polite tone this is designed to see how the user perceive and interacts with the different characteristic of the notification. The notifications were designed to be as trustworthy as possible and recognized as typical notifications generated from an existing social media application. Based on Nielsen's (2000) research on how many users needed to cover usability issues, the perception study was performed on six people, which makes it possible to draw initial conclusions (Nielsen, 2000). This test was supplemented with a follow up question after each decision to improve the level of knowledge about the users perception of the characteristics. Through this method the test for this study induced the user into a familiar feeling of a real-life situation and act naturally according to their normal behaviour, in addition to providing more information to the results.

4 Results

The results of this study collected as both data and extracts from interviews are presented and discussed in the following tables and lists. The study population mainly focusing on young adults with an equal division between gender and operating system used.

4.1 Results from survey

The survey was made available for one week and during that time generated 85 responses. The majority of the respondents belonged to the age group 18-29 and the distribution of

gender was almost equivalent between females and males. The responses to the six parameters stated in the method are listed in Table 2 according to the most picked option.

Table 2: Survey Responses

Notification Characteristic	Survey Responses
Amount	72.6% of the users stated that they only have enabled push notifications for a few important social media apps.
Frequency	40% of the respondents receive more than 15 notifications per day
Importance	31.8% evaluated the importance of social media notifications as number 3 on a 1-5 scale.
Action	54.8% stated that they open a received notification later on.
Behaviour	Option between two characteristics <ul style="list-style-type: none"> ○ The push notification with a more demanding character was selected by 53% of the respondents. ○ The push notification with a subtle and solely informative character was selected by 79.8% of the respondents.
Preferences	Examples of emotions towards notifications (based on the survey). <ul style="list-style-type: none"> ○ Happy: Snapchat, comments/likes on their own posts and friend requests on Facebook. ○ Annoyed: Suggestions in general, spam (advertisement) and comments on Facebook post they do not care about.

The demographic results from the survey of total 85 respondents are presented in Table 3.

Table 3: Demographic Results

	Percent
0-18	3.5%
18-29	90.6%
30-49	2.4%
50+	3.5%
Gender	Percent
Female	57.6%
Male	42.4%
Operating system	Percent
iOS	51.8%
Android	48.2%
Amount notifications enabled for social media apps	Percent
Only for a few important apps	72.6%
All of them	25.0%
None of them	2.4%
Frequency of receiving notifications	Percent
More than 15 per day	40.0%
5-10 per day	24.7%
10-15 per day	20.0%
1-5 per day	10.6%
None	4.7%
Importance of social media notifications	Percent
5 (very important)	3.5%
4	27.1%
3	31.8%
2	23.5%
1 (not at all)	14.1%
Action upon received notification	Percent
Open later on	54.8%
Open immediately	41.7%
Ignore	28.6%
Other action	4.8%
Behaviour to characteristic of notification	Percent
“10 people wants to be your friend, respond now or they will never return”	53.0%
“You have 10 new possible friends”	47.0%
“You have a new comment on your post”	79.8%
“Someone has written a comment you better read right away, or be ashamed”	20.2%

4.2 Results from perception study

The qualitative test resulted in six interviews and the average age of the test participant was 24.2 years old, across the group of young adults. Gender and OS was evenly distributed in the test group between females versus males and Android versus iOS. During the test they were presented with twelve push notifications. The topics of the notifications came in pairs with the same meaning, but with either of a demanding or informative character and were displayed in a randomized order. As stated in the methodology, the participants got the choice of either open or cancel the push. The statistics of their choices are presented in table 4 below, where the option with the most votes is highlighted in bolder font. Some participants stated that they would just lock the screen without taking any action upon the notifications, those are displayed with a line.

Table 4: Data from perception study

Type	Cancel	Open
Demanding	1	5
Informative	3	3
Demanding	1	4
Informative	3	3
Demanding	-	5
Informative	2	2
Demanding	4	2
Informative	5	1
Demanding	3	3
Informative	2	4
Demanding	5	-
Informative	5	1

The option between the pairs of different notification characteristics that got the most votes to be opened is displayed as the list down below.

Table 5: Notifications most likely to be opened

Notification	Responses
Happy Birthday	5/6 chose to open the demanding push “Check it out!! 143 friends has wished you a happy birthday!”.
New post	3/6 chose to open the informative push “Your friend has written a post”.
Friend request	This topic did not get a winner (equal). Both the demanding and informative push was opened by 4/6 people.
New message	5/6 chose to open the demanding push “You have just got 1 new message”.
New update	This topic did not get a winner (equal). Both the demanding and informative push was opened only by 1/6 people.
New push	3/6 chose to open the demanding push “1 new push, push them back now!”.

In total, the test participants chose to open a push of a demanding character 19 times and cancel 14 times. Of the informative character, the test persons chose to open them 14 times and cancel 20 times.

5 Discussion

When looking into the results of the survey and the perception study, some data can be discussed in the terms of participants’ behaviour. From the results it seems that most of the people involved in this study cared more about the identity of the sender of the notification, than the character of the push notification itself. From the survey, 72.6% of the 85 respondents only had activated push notifications for a few important social media apps and only 40% of the respondents usually received more than 15 notifications per day. The frequency of notifications did not differ between the genders of the respondents for this study. This differs from the previous research by Elslander and Tanaka (2013), which may be due to the smaller sample size in this study. That study found that the high frequency of notifications from social media apps has led to resentment against push notifications in general among young adults (Okoshi *et al.* 2015). This finding is something designers must take into account when developing this kind of functionality.

From the perception study, the notifications of a demanding character were predominant opened in comparison with the informative ones. Two of the topics got the same amount of the choice between open or cancel, those were “A new friend request” and “New update available”. Of the respondents five out of the six chose to open both the demanding and informative notification about a new friend request. Their reasoning behind this was that getting a friend request is always something that makes them happy and interested. It can also be argued that this is an extension of the phenomena of the Fear of Missing Out (FoMO) as stated in the study done by Przybylski *et. al.* (2013). This test shows that the user might care more about notifications if it has to do with their social life, since a missed friend request can give a pervasive apprehension that a rewarding experience has been missed.

The notification about a new update was cancel by five out of the six participants for both the positive and negative formats with the argument by the participant is that updates are

always boring. In comparison with a new friend request, an update does not usually give the user any rewards in the social context. These results speak to the significant factor of the users emotions towards the content of the notification. The notification could be made more irresistible for the user to open by taking advantage of the FoMO phenomena and by writing them in a way that is presenting the content of the notification as something that will be rewarding to the user (Przybylski *et. al*, 2013).

The follow-up questions provided additional clarification of and insights into the motivations behind the choices. Almost all of the participants stated that the most crucial factor when deciding what action to take upon receiving a notification is based on which app the push has been sent from. This factor can be difficult to change for the application designer as they only have control over the different characteristic of the content of the push notification not the app itself. However this finding is important for the developer to keep in mind from the beginning when creating the app. Today users apparently have a very strong relationship to their apps and know what to expect from them (Fox and Moreland, 2015). This relationship may have effected of the majority of the respondents for this study being young adults who have been active on social media since the beginning (Perrin, 2015). Therefore they know what to expect from different types of apps as the state of the relationship and the nature of the future interaction between app and user is setup in the very beginning from the first notification.

6 Conclusions

The results of the study show that people are used to receive a large number of notifications from social media applications everyday, even though they do not find them very important or interesting. The data from the survey also showed that people had really strong feelings towards some apps in particular. When they got to state their personal preferences, almost all of them felt resentment towards notification from Facebook, while notifications from Snapchat made nearly all of them feel happy.

The results from the perception study illustrate that notifications of a more demanding character were predominantly opened more often than the purely informative pushes, which is consistent with Turner, Allen and Whitaker (2017) who found that context is an influence on the decision to open. However, according to the test participants' feedback the most crucial factor in the choice to open a notification is base on which app sent it to them. The conclusion of this study is that the app-user relationship is set from the very beginning of the use of the app. This study identifies that the most suitable way of using push notifications for social media apps is to build up a trustworthy relationship with the user from the start by using a vocabulary that fits the common language of the user and avoid sending out notifications without content. The user will be drawn back into the app if they feel like the sender has good intentions and is given the user something in return on a fundamental emotional basis by opening the nonfiction. Opening notifications could be made more irresistible to the user by taking advantage of the FoMO phenomena, by writing them in a way that is presenting the content of the notification as something that will be rewarding to the user. There are several ethical issues that are raised when

discussing the use of notification because of the interruption of the user. Recent research is focusing on the impact of consumers' attention and overall wellbeing when being continually interrupted by notifications (Kushlev, Proulx and Dunn, 2016; Kushlev, Proulx and Dunn, 2017; Pielot and Rello, 2017). However, if the goal is to generate revisits, the results suggest that a demanding character of the notification is a good choice of direction and will generate a higher frequency of revisits. There are reservations to giving this recommendation to developers due to the potential stress this might put upon the user (cf. Karapanos, Teixeira and Gouveia, 2016; Kushlev, Proulx and Dunn, 2016) and the possible negative long-term consequences of the app-user relationship. With the proliferation of applications all demanding attention from the smart phone user, the design of apps and psychological impact of notifications will be a growing area of research (cf. Turner, Allen and Whitaker, 2017).

7 Limitations and Further Research

The study was undertaken with Swedish participants focusing on social media platforms. The research could be extended by carrying out cross country research to evaluate if the results hold true for young people from different cultural backgrounds that may have different usage patterns and use different social media applications. Though not within the scope of this study, further longitudinal testing of the users response it suggested to investigate if the users perceptions towards the notification changed over time or as result of their changing attitudes towards and use of the various social media platforms. While this research focused on social media applications uses are now bombarded by a variety of notifications from other applications such as calendar updates and instant messaging. Additional research could compare the impact of notifications from a wider variety of applications including those designed to have health or behavioural benefits (Hosch et al., 2017).

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