



An Investigation into the Effect of Smartphones Back Button Location on Users' Experience: A Case Study Comparing Apple iPhone and Android UI

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Authors' contributions

This work was carried out in collaboration between all authors. Author AR designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author US managed the literature searches and analyses of the study. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJRCOS/2018/1i224733

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Complete Peer review History: <http://prh.sdiarticle3.com/review-history/25502>

Short Research Article

Received 22nd March 2018

Accepted 26th June 2018

Published 11th July 2018

ABSTRACT

The use of touchscreens as an input method on Smartphones has become the norm in the mobile phone industry. This has changed the way keys are traditionally arranged on Smartphones devices. One of these changes is on the location of "back button". Few studies, However, have been conducted to investigate the effect of key locations on users performance and experience.

Aims: In this paper, we investigate the effect of back button location on users' experience of using Smartphones. We made a comparison between Android Samsung Galaxy S3 and iPhone 5s.

Place and Duration of Study: Participants: Sokoto State University, Sokoto, Nigeria. between May 2017 and July 2017.

Methodology: A total of 40 participants all Students of Sokoto State University participated in the study. 26 were males and 14 females. 30 owned Android Smartphones while the remaining 10 owned Apple iPhone. We used observation to observe how users navigate through Facebook and

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Gmail app on both iPhone and Android while paying attention to their use of the back button, the time it takes to locate these buttons and first point of reference. A semi-structured interview was also conducted on users, requesting them to compare how the difference in the location of the back button on iPhone and Android has affected their experience of navigating through both Facebook and Gmail app.

Results: The study reveals that back button key location affects the user experience of using Smartphones, keys located at the bottom edges are easier to locate and those located at top edges are harder to locate and press.

Conclusion: Based on the results, the study concludes that designers of Smartphones user interfaces should strongly consider user preferences when deciding the location for back buttons and on Smartphones.

Keywords: Smartphones keys; back button; user experience; touchscreens.

1. INTRODUCTION

Smartphones devices have become increasingly prevalent. These devices have witnessed increasing changes in their functionalities in the past few years, from the period where users' interaction was via keypads to the current period where interaction is mostly through touchscreens. Most current Smartphones have only few hardware keys and their touchscreens are used by users for almost all inputs [1]. However, the increased use of touch screen as an input method on Smartphones has brought some changes in Smartphones user interface specifically, keys layout. For instance, users of Smartphones are traditionally accustomed to the "back button" location being at the "bottom right of Smartphones. However, due to the evolution in Smartphones interface design and specifically the used of the touchscreen as an input method in Smartphones, the idea of placing "back button" in the bottom right location is slowly diminishing. Furthermore, increased in the number of Smartphones applications with each having its distinctive interface structure is also affecting "back button" location on touchscreen Smartphones. This can be seen for example on Apple iPhone and Android OS phones were on the former, depending on the application the user is interacting with, the location of "back button" is located either at the bottom left edge or top left edge of the device. Nevertheless, recent studies in this field have focused on the effect of the touch screen, button size and spacing on users' touch characteristics, Mary et al. [2]. Hence, our research differs from the mention existing research in a way that we would like to focus on investigating how the variation in the location of back-button affect users' experience of using touch screen Smartphones. In particular, the focus of our work was on comparing the UI

design of two major Smartphones devices: the Apple iPhone iOS and Samsung Android. The selected devices were chosen because they have different back button location. We used both observation and interview-based methods to carry out the study. The observation was used to observe the effect of "back button" location on the user experience of using two mobile applications, Facebook and Gmail on both Apple iPhone iOS and Samsung Android. Similarly, Semi-structured Interview-based questions were used to find the impact of this variation on users.

The report is structured into five sections as follows: Literature review which gives an overview of related work in the literature, Methodology section which discusses the data collections method used. Result section which presents the data gathered from the study, methods used to analyse the data. Discussion section which summarises the findings of the study in details. Conclusion section as the final section and summarises the overall contribution of the study to the field of human-computer interaction.

2. LITERATURE REVIEW

The question of how Smartphones key size and locations affect users' performance has been the subject of much attention in the field of User Interface Design (UI). Many researchers have conducted studies to find the effect of touch screen button size, button spaces and location on touch characteristics of users and users' performance. For example, a study by Park et al. [1] investigated the effects of touch key sizes and locations on mobile phone usability in terms of the success rate, the number of errors, and the pressing convenience. The result of the study revealed that the number of errors decreases as

touch key size increases, also the larger the key size the higher the success rate. In addition, the study reports that keys located at the bottom-right edge and those located at the top-left edge of mobile devices are hard to tap and often users need a considerable thumb flexion and extension to press keys in these areas. Although the findings of this research are important for UI design, the limitations are: The use of a PDA instead of a Smartphone, also a much more higher number of touch event is needed for a detailed analysis, especially when considering the touch screen of the PDA used by the authors which has a resolution of 240x320 pixels that provides 76,800 touch positions [3]. In another research, Karlson et al. [4] conducted a study to investigate single-handed mobile interaction, they looked at how device size, target(button) location, and movement direction influence thumb mobility. The study concluded that device size is not a factor in determining how quickly users can access objects within thumb reach, but that larger devices have more areas that are out of reach implying that the location of buttons impacts performance more than device size. This is however not in all cases, as Xiong and Muraki [5] in their study of the effects of age, thumb length and screen size on thumb movement coverage on smartphone touchscreens found that thumb-coverage area actually increased when the touchscreen size was increased though not at the same ratio.

Perry and Hourcade [6] presented a similar study and evaluated one-handed thumb tapping on mobile touchscreen devices. They looked at the usability effect of target/button location on user's accuracy of tapping, the research shows that participants found buttons/targets near the centre of the screen as easier and more comfortable to tap, although the study also found that participants tapped faster in the middle of the screen and the edge closest to the hand. In another comparable study, Park and Han [7], investigated input accuracy and pressing patterns of one-handed thumb interaction, they found that success rate increased with target size. Other researches such as those by [8-10] all investigated this phenomenon. While these studies have all looked at the effect of key size, key location on Smartphones's usability and key size pressing accuracy, none of these researches analyses how the actual location of Smartphone keys affect user experience. Despite the study by McNamara and Kirakowski, [11] and Young et al. [12] confirming the existence of a relationship between system's usability and user

experience. Therefore, the aim of this study is to investigate the effect of back button location of touch screen Smartphones on users' experience of using Smartphones applications.

3. RESEARCH METHODS

3.1 Subjects

A total of 40 participants all Students of Sokoto State University participated in the study. 26 were males and 14 females. 30 owned Android Smartphones while the remaining 10 owned Apple iPhone. All participants are Nigerians and are used to left-to-right writing systems.

3.2 Experimental Design

The study was divided into two phases. The first phase was an observation phase, participants were asked to perform some tasks involving the use of back button. Specifically, participants were asked to:

Interacts with Facebook app and perform some tasks using either Android or iPhone iOS.

Clicking a link within an email and to use "back button" to go back to the email's inbox. An observation sheet was used at this phase to capture and record information regarding participants' interactions, participants details such as the ability to locate a back button while interacting with the Smartphones, emotions and time it takes them to locate the back button was recorded. The second phase was an interview, in this phase, participants were interviewed regarding their experience of the previous stage.

3.3 Apparatus

Android Samsung Galaxy S3 (Height 142mm, 72.5mm width) and iPhone 5s (Height 123.8 mm, 58.6 mm width) were used. These devices were chosen because of their dimensions which is a clear representation of present Smartphones. Specifically, because they have different back button location. The iPhone back button is merely dependent on the application a user is interacting with, although the home button could also be used in place of the back button. The Samsung Galaxy has its back button positioned at "button right". In addition, the devices used were owned by the researchers.

4. EXPERIMENTAL PROCEDURE

Each participant was given written instructions on the experimental objectives and procedure at the

start of the experiment. Participants were also given the research consent form at this stage and were asked to perform the following afterwards:

Open a Facebook application, click any link within it and try to go back to the home page by using the back button.

Open any email application, for example, google mail or yahoo mail, click message with a link in its content, click the link and try going back to your inbox.

However, depending on which Smartphones a participant is using for example, if the participants are android users, then they are asked to first perform the above tasks on iPhone and then repeat the same tasks but this time on Android. For iPhone users, a similar procedure was adopted but in this case, they were asked to first perform the tasks with Samsung android and then repeat same tasks on iPhone. The idea is to have participants perform these tasks on a smartphone with different OS than theirs.

In both ways, participants' interactions with the Smartphones and specifically the "back button" was observed and recorded. After the observation stage, participants were interviewed regarding their experience of using both devices and whether the difference in the location of "back button" on the two smartphones has affected their experience of using these applications.

4.1 Observations

The observation was the first stage of the experiment and was applied to observe how users' use back button to navigate through mobile applications and the effect of back button location on user interaction. Observation sheet was used to record users emotions while locating the back button. The terms "confused" and "confidence" was used to refer to users' emotions when trying to locate the "back button". The time it takes a user to locate the button and his/her first point of reference (i.e where he/she first looked at) was also recorded.

4.2 Interviews

A semi-structured interview was used to ask users on their experience of locating the "back button" and the location they think is the most

preferred for placing a back button on touchscreen Smartphones devices.

5. RESULTS

5.1 Observation Results

Three variables were observed at this stage: users' point of reference when asked to locate "back button", their emotions, and ability to locate the button. Figure 1 shows iPhone users first point of reference when asked to locate a back button during the interaction. In figure 2, we show the first point of reference for Android users on both iPhone and Android.

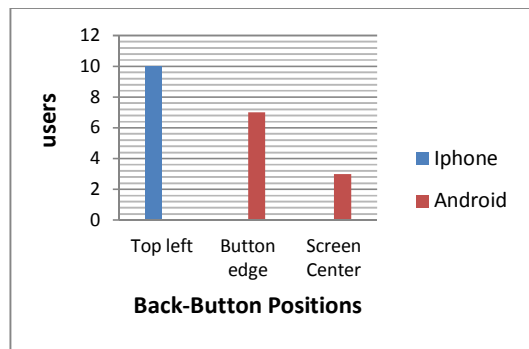


Fig. 1. iPhone Users first point of reference when asked to locate back button on both iPhone and Android smartphones

From Fig. 1, we can see that 10 out of the 10 iPhone users referred to the top left side to locate back button when performing the experimental tasks on iPhone. 7 out of 9 of this same group of users referred to button edge when asked to perform similar experimental tasks on android. 3 were found to refer to centre of the screen when asked to perform a similar task on Android.

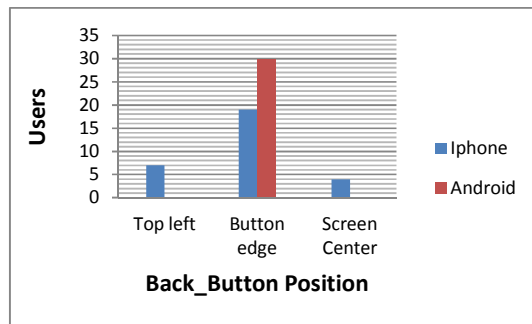


Fig. 2. Android Users first point of reference when asked to locate back button on both Android and iPhone Smartphones

From Fig. 2, it can be seen that 30 out of the 30 android users all referred to button edge when asked to locate back button on Android. However, when performing similar experimental tasks on iPhone, 7 participants referred to the top left, 19 referred to button edge and 4 referred to screen centre.

Table 1 shows the number of users that were able to locate back button. 8 out of the 10 iPhone users were able to locate the button on Android and perform the required tasks both on Facebook and Gmail. 17 out of the 30 android phone users were able to locate the back button on iPhone when interacting with the Facebook application and 6 during interaction with Gmail.

Table 1. Users' ability to locate back button on both Facebook and Gmail application

	Facebook	Gmail
iPhone users on Android	8	8
Android users on iPhone	17	6

With regards to user's emotion, while trying to locate the back button, 8 out of 10 iPhone users were confident in locating "back button" on Android. However, all Android users show some level of confusion when locating back button on iPhone.

5.2 Interview Results

During the interview session, iPhone users were asked to compare their experience of interacting with Android and how the difference in back button location has affected their interaction with Facebook and Gmail app. 7 out of the 10 participants said finding the button wasn't hard, it was clearly marked, very easy and convenient to use. Users also like the idea of the button being placed on the button edges, specifically 2 users mention it was helpful for people with the short thumb. Another user also complained of his thumb covering the screen when the button is located at the top edges, saying this has a negative impact on interaction hence he prefers it at the button edge. Users also complained of the existence of two buttons when navigating on Facebook app, one located within the app and another which is physically on the button right edges of the phone hardware, they believe this is wrong as it can put a beginner user in a dilemma on which button to press. Finally when asked if they think iPhone should have a physical back button users said no, iPhone design makes them unique.

Similarly, Android users were asked to describe their experience of interacting with iPhone and how the location of the back button on iPhone has affected their ability to locate back button both on Facebook and Gmail. All the 30 participants said it was challenging. The 17 users that were able to locate it while interacting with Facebook said it was because the button was present as a touch screen button at the top left of the Facebook app. However, on their inability to locate the back button when told to go back to their inbox after clicking a link within their email, users attributed this to the absent of noticeably physical button on or touchscreen button on both the iPhone and the Gmail app. Finally, when asked what location would they prefer a back button to be, 1 user said it doesn't matter as long, as the button is physically present somewhere, users would get used to it with time. 2 users, however, said they prefer it at the bottom edges. To them back button on either physical or touch screen should always be at the button edge, they said this should be taken into consideration by designers of Smartphones interfaces especially considering how Smartphones screens heights are increasing day by day.

6. DISCUSSION

Location of back button affects user experience according to the result. Physically noticeable keys especially those located at the button edge of mobile phones are easier to locate by users. The result shows that users refer to button edges of Smartphones when told to locate a back button on phones they are new to, this could be attributed to the fact that users are traditionally used to having back buttons located at the button edges of mobile phones. Another interesting finding is on users' thumb size and length in relation to their ability to press a button. Based on the interview results, users consider positioning of back button at the top edges to affect their interaction experience, this confirms the findings by Park et al. [1] that top-left edge keys are hard to tab and often users need a considerable thumb flexion and extension to press keys in these areas. Hence, it is important for Smartphones UI designers to note that although having an aesthetic design is good, designing for user experience is very crucial as it makes system helpful, convenient, enjoyable and satisfying. Nevertheless, the limitation of this study is on its data collection approach. The study was conducted while most students were writing their exams hence not many agreed to

take part. Another limitation is on the data collection methods. Although the use of observation allowed us to observe the real difficulty encountered by users while locating back buttons, interviews also allowed us to follow up on some interesting issues mentioned by users. However, these methods are time consuming and requires extra techniques for the captured data to give better meaning. For example, interview results need to be codified using for instance content analysis. I believe questionnaires would have been the best choice as it would be easier to reach a large number of audiences and also ask more questions. In future, the research could be extended with the application of the more sophisticated statistical method to find if there exist any relationship between user experience and key locations on Smartphones.

7. CONCLUSION

This study was conducted to find the effect of back button location on the user experience of using Smartphones. Results from interviews and observation techniques show that (1) back button keys located at the button edge of Smartphones are easier to locate for novice users, (2) That users prefer a back button to be positioned at the button edges of Smartphones. Specifically, if the phone has large screen size. These results imply that designers of Smartphones user interfaces should strongly consider user preferences when deciding the location for back buttons on Smartphones although this could mean finding a balance between aesthetic design and designing for user experience.

COMPETING INTERESTS

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

REFERENCES

1. Park SY, Han SH, Park J, Cho YS. Touch key design for target selection on a mobile

- phone. Proceedings of 10th International Conference on Human Computer Interaction with Mobile Devices and Services. 2008;423-426. DOI: 10.1145/1409240.1409304
2. Sesto ME. Effect of Touch screen button size and spacing on touch characteristics of users with and without disabilities. The Journal of the Human Factors and Ergonomics society. 2012;54:(3):425-436. Available:<http://journals.sagepub.com/doi/abs/10.1177/0018720811433831>
3. Henze NR, Boll S. 100,000,000 taps: Analysis and improvement of touch performance in the large. Paper presented at the 13th International Conference on Human Computer Interaction with Mobile Devices and Services. 2011;133-142. DOI: 10.1145/2037373.2037395
4. Karlson AK, Bederson BB, Jose LC. Understanding Single-Handed Mobile Device Interaction; 2006. Available:<http://hci2.cs.umd.edu/trs/2006-02/2006-02.htm>
5. Jinghong X, Satoshi M. Effects of age, thumb length and screen size on thumb movement coverage on smart phone touchscreens. International Journal of Industrial Ergonomics. 2016;54:140148. DOI:<https://doi.org/10.1016/j.ergon.2015.11.004>
6. Perry KB, Hourcade JP. Evaluating one handed thumb tapping on mobile touchscreen devices. Proceedings of Graphics Interface. 2008;57-64. Available:<https://dl.acm.org/citation.cfm?id=1375725>
7. Park SY, Han SH. One-Handed thumb interaction of mobile devices from the input accuracy perspective. International Journal of Industrial Ergonomics. 2010;40 (6):746-756. Available:<https://doi.org/10.1016/j.ergon.2010.08.001>
8. Eui SJ, Youngjae I. Touchable area: An empirical study on design approach considering perception size and touch input behaviour. International Journal of Industrial Ergonomics. 2015;49:21-30. Available:<https://doi.org/10.1016/j.ergon.2015.05.008>
9. Hara K, Umezawa T, Osawa N. Effect of button size and location when pointing with index finger on smartwatch. In: Kurosu M. (eds) Human-Computer Interaction: Interaction Technologies. HCI 2015.

- Lecture Notes in Computer Science. Springer, Cham. 2015;9170.
10. Phoung. A Study of One-handed Interaction of Large Smartphones: GUI Changes for Better Ergonomics(Master's Thesis).Available from Norwegian University of Science and Technology, Norway; 2015.
Available:<https://brage.bibsys.no/xmlui/handle/11250/295949>
 11. McNamara N, Kirakowski J. Defining usability: Quality of use or quality of experience? Proceedings of the international Professional Communication Conference; 2005.
DOI:10.1109/IPCC.2005.1494178
 12. Young GJ, Jun HP, Cheol L, Myung HY. A usability checklist for the usability evaluation of mobile phone user interface. International Journal of Human-Computer Interaction. 2006;20(3).
DOI:https://doi.org/10.1207/s15327590ijhc2003_3

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