Button/Target Tapping Based Gestures Verus Swiping Gestures in Mobile Human Computer Interaction

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Abstract— The objective that was to be accomplished was to figure out if the touchscreen interface of button pressing is favored over Swiping gestures. This paper will explain with statistics whether the user found swiping gestures to be more suitable or if button pressing gestures are more suitable. The interviewed where given little instruction. The overall goal is to see which methodology was deemed better for the user. This contribution to society will provide an insight over how to design smartphones for the future. Specifically, if the home button being on devices is truly needed anymore/or in favor within the user's standards. I wanted to show the world the results of what was in favor, that way we could enhance the way we make and develop for IOS and Android products in the future.

I. INTRODUCTION

The objective of this study is to present the user with two primary means of inputting data with gestures. The gestures of pressing a target in the form of button pressing and swiping gestures will be the two gestures presented to the user via IPadOS application. This contribution will not only give user perspective but also report to people as to what gesture the average user prefers when interacting with their devices. This contribution will Enable hardware Developers and Software Developers to target making their user interfaces to what the public deems as the better input methodology.

I hypothesize that swiping will prevail as the preferred gesture of User Interaction as it is more efficient to swipe anywhere then that of a targeted place. This can be placed into bull simply by implying that swiping has no significance over target/button like gestures on a surface interface.

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II. RELATED WORKS

Other users have been studying the differences between Swiping and Button/Targeted based gestures.

A. User Insight[4]

Breaks down the trends of UI over the times as companies aim to develop for what is modern and less problematic to users. Labeling the Positive and Negative features of Swiping and Tapping. Labeling the benefits of swiping as natural for moving items and screen manipulation. As well as, going into depth on how buttons are straightforward and affordable for designers. [4] This article structures the results to be in favor of Swiping gestures due to the natural interactions that it provides. However, some may prefer buttons due to the confusing of swiping versus scrolling in applications.

B. Xue Dou & S. Shyam Sundar [1]

Dou and Shyam conducted an argument to why websites should add more horizontal swiping to tapping when interacting on a mobile device. By conducting a study to show the problematic structure of how the natural horizontal swiping direction is not implemented in mobile websites, when it would be in the best interest of developers to incorporate such. By utilizing user engagement to answer their question "How does the addition of swiping interaction technique influence the user engagement?" [1] by capturing the overall enjoyment of the application with the incorporated feature.[1] This conference paper, not only captures the enjoyment of the user, but it extends that swiping to horizontally scroll added vast increments of enjoyment in app usage.

III. METHOD

My Hypothesis of this experiment is that Swiping gestures are more favored over Button Gestures due to the lack of buttons on modernizing devices. The Method taken to the experiment goes as follows in a bulleted list.

- The user is briefed with the rulings of the application.
  - The user is not permitted to leave the application at any time and resulting in so may result in disqualification. This includes Hitting the home button as well as opening the Control Center
  - When the user is prompted with the prompt "See Tony" followed with a number, they are to put the device on the table without touching it furthermore and then capture my attention for further instructions.
- The user is presented with the app running on an iPad Mini Gen5 Running iPadOS 13.2 in front of then and are told please do as the app tells you to do.

The Experiment is aimed to get the user to experience both Button like gestures and swiping gestures; therefore, to prove my Hypothesis both methods are to be tested by the user. With the results being based off of a "which one do you prefer" scenario, the user will need to test both subjects. Within Subject Testing was used to produce the following results because if the user was to only test one then the information with the other gesture would not be taken into perspective with the user. In all, the user must test both sections to enable significance is able to be captured between the two test subject matters.

The application is question is an IPadOS application that is designed to give the user two quiz-based scenarios with only four methods on inputting an answer. Each labeled as the Swiping section for testing swipe-based gestures. As well we the Button section for testing the target/button-based gestures on a touch surface.

Upon the application opening the main screen will open up, this screen should not appear to the user as it may imply the purpose of the study to the user. This section for the proctor will enable the proctor to select the selection that they want the user to complete. To start the testing with the user, the proctor will need to click the button that is labeled "Swiping Section" as the first section. When the User is prompted to stop the proctor will need to provide the User with a CSUQ quiz. The proctor will fill in the first section for PID and section that was completed. While the user is completing the CSUQ Survey, the proctor will navigate back to the home screen and select the next section (Button Pressing Section) from the second button on the home page and present it to the user upon survey completion.

The Swiping section will prompt the User to either Swipe up, swipe down, swipe left, or swipe right on the screen. The direction the user swipes will be recorded whether it is right or wrong and proceed to the next question. The progress of the question will be swipe up, down, left, right, up, down, left, and finally right. After the 8 actions are completed the Question text will change to "STOP, SEE TONY" with a number concatenated to the end of it. The number here will not be explained to the user however that number is the amount of questions they got correct. Only users with a score of 8 have their data collected.

The Button Section is the exact same structure as Swiping with 8 questions that the user must order on similar sequence. Only thing is that the user will have to press the buttons on the screen that correspond to what is prompted. The user must select the following buttons in the following sequence: A,B,C,D,A,B,C, and then D. After the 8 actions are completed the Question text will change to "STOP, SEE TONY" with the correct number of inputted action concatenated to the end of it.

After all testing is done, Then ask the user if they prefer swiping or button pressing when it comes to using their phone

IV. Results

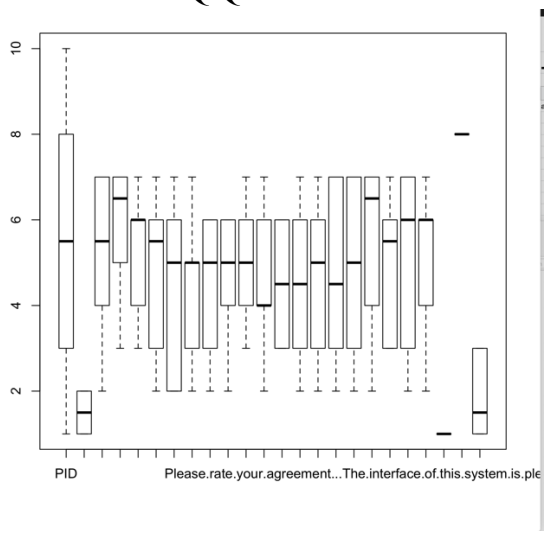
The Following information is produced from The resulting CSUQ Questionnaire with Kruskal-Wallis Significance Testing

	All
Overall CSUQ	0.2073
System Usability	0.4647
Information Quality	0.1161
Interface Quality	0.5271

The Following information is produced from the CSUQ Questionnaire using Wilcoxon Signed Test

	All
Overall CSUQ	0.005793
System Usability	0.001953
Information Quality	0.005889
Interface Quality	0.005857

The Following information is a Box chart representation of the Results gathered from the CSUQ Questionnaire



The Following information is information gathered from the user that are not calculated

User	Representing PID	User Score Correct	User Preference
01	S01, B01	8	Swiping
02	S02, B02	8	Swiping
03	S03, B03	8	Button
04	S04, S04	8	Swiping
05	S05, B05	8	Button

V. Discussion

A. Sigificance Testing

After concluding my results, I have decided that this test has no significance once so ever. The results of the experiment are in support of rejecting my hypothesis, due to the lack of information. The data does not feel complete and that I need more education on the subject matter of performing a Kruskal-Wallis Significance test. The following information from Kruskal-Wallis shows that the area with the most significance is the Information Quality, which ultimately to me means that the app was straightforward and easy to use. Or that it was well made.

With that said I wanted to get another measure of significance measured into the data and with that I decided to

The next most significant feature was the overall structure of the experiment. Therefore, I chose to utilize the Wilcoxon Signed-rank test to gather results. However, the results I produced are very

significant it seems. However, with the limited amount results, I cannot rule my testing to of had significant results in supporting my hypothesis. However, they do not reject my hypothesis which ultimately states that my results are inconclusive from significance testing.
The lack of experience with Significance testing makes me to believe that I cannot find the answer from statistics alone; however, the results from significance testing validate that the information presented was put together nicely and that the quiz was easy to follow as all tested users scored perfect scores on getting the correct results.

B. Post Survey Results

The information that was the most interesting to me as the majority of the users preferred swiping over buttons on an after survey that was taken. But it dawned on me as a margin of error because they may be referring to experience in the app as opposed to their everyday life usage. Which is not what I was looking for. However, this does prove that swiping gestures were more preferred over button gestures in the end; however, on to the context of my application. To get more accurate results I would need to learn more about how to apply significance testing to CSUQ data. As well as, experiment with different devices. The user preference could vary based off of the mobile device. It was not premeditated however I would consider it valuable information to discuss about. As the Android operating system is very target based with user UI which ultimately could produce other results. That lack of Device diversity causes these results to be up for speculation.

Even so other factors were not taken into consideration when considering results, such as the strong hand of the user, the gender, sex, or the age. The demographics of the user may influence that of which they are prone to use mobile devices, which hence-forward will alter the results in various ways.

C. Potential Biased Results

Final Discussion s resolve around potential bias with the users. Given that all of the tested participants are users that I know personally as they were all family members of mine. Therefore, the implication of Bias cannot be nullified due to personal relationships with the users. I do believe that the information that is presented here. Also given that Apple is aimed to design applications to be capable of handling more swipe gestures such as 3DTouch and Haptic Touch [2][3]

D. User Confusion

The instructions were vaguely given to the user and no questions were answered. I took the question asking as an advantage that I cannot provide to people. Also, to maintain equality to the testing I figured that I would not enable myself to enable others to have an advantage over others. In all, I did not answer any questions and I believe that during testing that had influence to the answers in the CSUQ Questionnaire in the end.

Another factor of confusion is the question towards the end of the experiment as Buttons are interpreted as physical buttons on the device and not those coded in software. So the results at the end may not be as accurate as it may seem due to the user not fully comprehending what it means to be pressing a button in this scenario.

E. Disqualified Data

When disqualifying data, I had only one scenario where I had to do so. That is when the user requested, I remove their data. However, the data they provided may have been contributed in a better matter to the study to get clearer results.

The disqualifying factors of this experiment are that if users navigated outside of the application then they are disqualified. As well as getting advice and references from outside sources. The assist in stylists devices such as the Apple Pencil is prohibited and will result is disqualification.

CONCLUSION

In Conclusion, I do not think the results support my Hypothesis; as well as, I do not think they disprove it once so ever. I believe these results are inconclusive given the potential bias and lack of Statistical data.

Bases off the post question that I asked my users in the end though, I would say that my Hypothesis has merit and worth more to study into in timelier and efficiently constructed matter.

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