

# Design UI/UX Mobile Games for Left Hand Dominant People

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**Abstract**—The purpose of this research study is to get correlation between left-hand-dominant people with normal layout from mobile games application, and also to get the best suggestion layout for user interface & user experience design (UI/UX) mobile games towards left-hand-dominant people. Quantitative method is used for examination between left-hand-dominant people with user interface layout design. There were 22 left-hand-dominant people who love playing mobile game based. All participants played mobile game (PUBG- PlayerUnknown's BattleGround) for 10 minute with 2 different layouts, normal design from developer and our modified design layout. Result; normal design layout is not significantly give any issues. Left-hand-dominant people accepted that normal basic layout. Before mobile games era, there were gamepads or joysticks with same standard layout buttons towards UI/UX mobile games screen and they were feeling fine about it.

**Keywords**—user interface, user experience, game mobile, left-hand-dominant people.

## I. INTRODUCTION

In the past decade, user interface design pattern for hand dominance has gained wide research interest resulted in a vast number of research reports available in literature. e.g., study by Al-Samarraie and Ahmad [1] reported some research findings on correlation between hand dominance and design pattern of mobile learning. One important result is that left-hand-dominant participants were significantly different from right-hand-dominant participants with respect to their use of design pattern in learning. Based on the pattern classification, they developed a scale hierarchy of design pattern for mobile user interface in learning. Left-hand-dominant learners were more adaptable to patterns relative to right-hand-dominant learners. Unfortunately this study did not elaborate the effect of left-hand-dominant people to mobile game interface design. Another research about user interface for mobile game by Browne and Anand [2] included 4 left-hand-dominant people on it. They empirically tested the effectiveness and enjoyability of three user interfaces used to play an iPod Touch scroll shooter video game, to explore the effectiveness and enjoyability of these

user interface options, the game was implemented with an accelerometer based interface, a touch screen based interface involving simulated buttons and a touch screen based interface involving finger gestures. They presented statistically significant results that the accelerometer based interface was the preferred interface. Nevertheless, because this study published at 2011, the application mobile technology on that year was still limited, so they just prepared simple buttons on the screen, left side for basic movement and the right side only provide one button for fire shot action. Today, mobile game applications such as action, adventure and shooting genre give multi buttons interface with unique and more detail actions from each game characters.

As universally known, generally people use their right hand more than left-hand. For the entire world, population which is more agile and strong with left-hand is relative small, only between 10-15%. Franklin said in journal "Left-handed People in a Right-handed World: A Phenomenological Study" by Y. Masud and M. A. Ajmal [2] For centuries, researchers have been in study for the answers that why people have a preference for left-hand over the right and why left-hand-dominant people are chosen in minority. The evidence for determination of left-hand-dominant has been attributed to heredity, environment, or brain functioning and data of various sorts have been used in attempts to establish one fact or another. The study by Kopiez & Sommer, 1999; Köve, 1997 and Pawlik- Kienlen, 2008 in Y. Masud and M. A. Ajmal from Pakistan Journal of Social and Clinical Psychology [3] argued that left-hand-dominant people can learn foreign languages better and faster, have stronger spatial perception, are more creative, and their visual memory is more organized. Left-hand-dominant people are somehow more flexible than right-hand-dominant. They appear to be capable of switching over their hand for performing tasks more easily than right-hand-dominant people. They can think more quickly when playing computer (i.e. mobile games) or sports, therefore they are considered better player than right-hand-dominant people.

User experience (UX) refers to a person's emotions and attitudes about using a particular product, system or service. The principle of building user experience must be according to user itself (i.e., customer role). Wiryawan in Humaniora Binus 2011 journal [4] explained about the evolution of digital media and mobile phone gave impact to user experience become more complicated and multidimensional. e.g., user experience website design with desktop computer is not same with mobile phone. Before smart phones generation became available to users, mobile games were less attractive. Small screens but complexity of control buttons were the main issue for several game developer company. Therefore, only a few people played mobile games. Nevertheless, the advent of smart phones developer made a huge number of games and even more game genres available for mobile phone users. Famous developer engine provide mobile games and unique applications to their customers via app store or google store. Game interface, gameplay, and experience of mobile game should be efficient. Complicated screens are going to be a big problem for gamers. Every images and icons should be as simple as possible, and there should be only a minimal amount of textual information on screen. The game simplicity must be considered since small screen in mobile phone and this may causes difficulties towards user interface and user experience itself.

Mobile game is any type of game which is played on mobile devices. There are a huge number of mobile games available in app store or google store. Nevertheless, there are only a few popular mobile games. Playability about game's environment is the important factors in making a successful mobile game, and the existing playability problems have to be identified and solved before that game is ready to be released.

Before mobile games era, gamers used joystick/gamepad for control their characters inside the game world, according to some consoles like Sony Playstation, Sega, X-Box or Nintendo used a similar layout for controller pad (left side for movement and right side for several action buttons). M. Brown in Beyond the Gamepad: HCI and Game Controller Design and Evaluation told about [5] majority of games have been designed to operate with standardized (or de facto standardized) platform specific controllers, e.g., each game console has an associated standardized first-party controller.

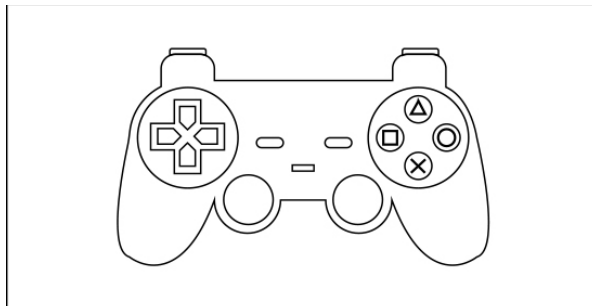


Fig 1. Sony Playstation Joystick

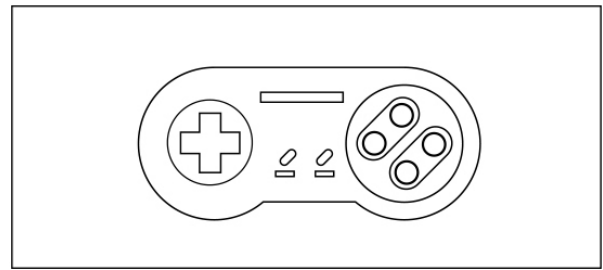


Fig 2. Super Nintendo Joystick

Today, most games running on consoles supported by standard game controller; mobile phone games are played using the standard phone controls; and the recent technology of devices combine with touch screen have also supported that interaction method in game environment. Touch screen methods in mobile phones made them available to the wider population. Furthermore, this made it possible for game developers to make games which heavily use touch-based interactions. Touch screen phone devices has the characteristics of having very few physical buttons and most of its users input interfaces are made through touch by finger or pen. M. Joselli and E. Clua in "gRmobile: A framework for touch and accelerometer gesture recognition for mobile games" [6] explained about most of touch screen method can have two kinds of input: pressed and dragged. Pressed is used when the user press hard on the device screen, and or like a computer mouse button pressed. Dragged is used when the user touches softly and can be used as a computer mouse being dragged. New era modern smartphone has multi-touch screen devices like iPhone and Android system based. Some of these devices have used this methods of input as gestures to enable good user experience: like dragging for changing the website pages, zooming options on image viewer and many others features. Mobile game developers can add several buttons, design it positions and size of any buttons at the screen of smartphone. A. H. Cummings [7] told, one of the purposes for game interface is the ability to do something normally and have your action reflected in the game world by your game character. Computer vision technology is used to analyze images of the player's movements and transform it into movement in the game world environment.

Best design user interface (UI) layout is the important things for every gamers, not only for fun but now several mobile games were turning into the prestige game which has a big tournament (eSports) with a big amount of prize, in study from J.Smith [8] told eSports is short for electronic sports. It is where players compete playing computer games (i.e., mobile games) The eSports boom began in the second half of the 2000's as games like Starcraft and Counter-Strike became mainstream, internet media helped eSports become mainstream was the addition of many streaming services such as Youtube and TwitchTV. People whose dedicated to be a professional gamers seriously need a best user interface and experience game design for support them to achieve a winning. With all these attributes, even if life has become slightly better for left-hand-dominant since human progressed from caverns to modern city, living in a world planned and particularly designed to match the needs of advantaged majority (i.e., right-hand-dominant people) and it still gives

an issue. Hardyck and Petrinovich [9] said in a technological society, most devices are designed for the right-handed. Simple use of devices such as can openers made to be turned with right-hand, scissors angled so that the cutting edge is appropriate for right-hand usage, and other such devices undoubtedly has some effect on the incidence of certain types of hand activities. This is a research about uses of design interface towards left-hand- dominant people when playing mobile games. Because games genre like FPS (First Person Shooter), Action MMORPG (Massively Multiplayer Online Role-Playing Game), Battle Royale, or MOBA (Multiplayer Online Battle Arena) literally only give one purpose layout in their games. Right side is for skill and action buttons, but the other hand, left side is for movement character. We need to consider users' with left-hand-dominant also want perfect design interface for their needed in game environments.

Following questions were recognized for this research :

1. How is the experience of left-hand-dominant people when they tried normal layout for design mobile games ?
2. How is the good layout UI/UX design for mobile games refers to left-hand-dominant people ?

## II. RESEARCH METHOD

The research presented specifically examines the experience of left-hand-dominant people in game UI/UX design layout.

### A. Respondent Criteria

All participants with left-hand-dominant people. Typically, they used left-hand for writing, eating, cooking and some several daily activity. Understand about game mobile is a must, and never tried our sample game (PUBG-PlayerUnknown's BattleGround) before they try our modified layout, we are considering this rule that because learning issue will distract our experiment result.

### B. Sampling Technique

There were 25 left-hand-dominant people around West Jakarta (Indonesia) especially university students and a few lecturers. We eliminated 3 people because they were not a gamer or they had been trying our sample game before. Thus, the remains of our participants are 15 men (68.2%) and 7 women (31.8%). Their ages ranged from 18–42 years. All participants will play game sample for 10 minute every layouts, and they answer our questionnaire after it. For measurement, we provide number 1–5 for point of satisfaction every layouts. Number 1 refers to (very bad), number 2 (bad), number 3 (average), number 4 (good), number 5 (very good).

### C. Data Processing and Analysis

After we received all of data from 22 participants, we used mean formula for processing it, and we compared the result between original layout from game developer and modified layout. The highest score from mean formula refers to the best layout for left-hand-dominant people.

$$\bar{x} = (\sum x_i) / n \quad (1)$$

or

$$\bar{x} = (x_1 + x_2 + \dots + x_n) / n \quad \bar{x} : \text{sample mean}$$

$x$  : satisfaction point from layout

$\sum x$  : sum of  $x$

$n$  : number of participants

Mean is the arithmetic average of the scores. It is computed by adding all the scores and dividing by the total number of scores.

## III. PROCEDURE

### A. Device Model

We used iPhone 7 as a main device for our participants, size 138.3 x 67.1 x 7.1 mm (5.44 x 2.64 x 0.28 in), weight 4.87 ounces (138 grams), 4.7-inch Retina HD LED-backlit widescreen, with resolution 1,334 x 750 pixels (326 ppi).

### B. Game Sample

Alexandra Cata 2017 with theses and dissertations, Playing with Usability: Why Technical Communicators Should Examine Mobile Games [10] told about mobile games represent effective and ineffective user assistance holistically; popular apps rise to the top and garner thousands of downloads, while unpopular apps sink to the bottom of the app stores. Popular mobile games are excellent examples of well-designed mobile interfaces communicating complex information while allowing users to intuitively explore and learn within the app.



Fig 3. PlayerUnknown's BattleGround

The title of our mobile game sample is PUBG Mobile (PlayerUnknown's BattleGround), we choose a TPS (Third Person Shooter) game-mode for this research as a sample of popular game. Because with this game, users need to rush both of their hands in the same time. The other reason, this game has many buttons in left and right side, this game genre is Battle Royale, game mode will put up to 100 players on a remote island for a winner takes all show down where strategic gameplay is as important as shooting skills. Players will enter a last-man-standing battle where they try

to locate weapons, vehicles and supplies in a graphically and tactically rich battleground that eventually forces players into a shrinking play zone as they engage in a tense and spectacular fight to the death. Jonas Elam in Spartan Daily October 2017 [11] explained about Brendan “Player Unknown” Greene is a game developer with a history in this genre. Many members of the genre’s community consider Greene to be the pioneer of the genre as a whole, starting with a modification of the game “Arma II” called “DayZ”. According research from J.Beeston et al., in journal Accessible Player Experiences (APX): The Players [12] they conducted a demographic survey of 154 players with disabilities, and they found PUBG as rank 4 from top favorite game.

### C. Experiment



Fig 4. Normal basic template layout from game developer(Display left-side fire button: Scope On)

We have changed buttons layout design for this PUBG Mobile before our participants understand how to play this game (PUBG Mobile gives possibility to change layout button positions). We prepared different game layout, left side for action buttons (skills and attack) and right side for game character movement.



Fig 5. Modified layout

Fig 4. is the basic template from game developer, they used common layout for normal user. Fig 5. is a different layout, we changed the right side to be left, and the left side to be right position. We have prepared 2 stages of experiment. First stage with modified layout (Fig 5.), all participants with left-hand-dominant played this game for

10 minute. After that, they also tried the normal basic template (Fig 4.) from game developer for our comparison. Basically, we gave a basic knowledge about PUBG Mobile to our participants in order to understand game feature.



Fig 6. PUBG Mobile inventory tab

We also provide 2 kinds of game characters, male and female. Every participants deal with same gender toward their game character. The experiment begin with participant choose some wardrobe from inventory tab, we want all of our participants can recognize their own character before they play it. All participants started game with single classic game mode for 10 minute. After 1 minute at waiting room, game character jumped from airplane to several spot around Erangle map (island with bushes and trees make great hiding places for ambushing), after they landed, our participants got instruction from us to collect guns and weapon tools around (normal scenario from PUBG Mobile). Thus, with this moment, our participants were trying to control their own character for the first time. After they got weapon, we ask our participants to find enemy and kill it. If our participants got killed before 10 minute, it means they cannot continue that match, so we ask them to play it again with same game mode. We counted every minute toward every match they played in the real game environment.

For the first stage of our experiment (Fig 5.) with modified layout, 12 of our participants must repeat their game match 2-3 times because accidentally they got killed by enemies before 10 minute. Furthermore, for the next stage our experiment (Fig 4.) with basic normal developer layout, 9 of our participants also need to repeat their game match. We considered Battle Royale's game genre like PUBG Mobile not only need knowledge and skill to play it, but also luck in other to win this game. It means, we did not count about kill-dead score game result from our participants.

## IV. RESULT & DISCUSSION

Here it is a satisfaction table result from 22 left-hand-dominant people after tried our experiment.

TABLE I. PARTICIPANTS SATISFACTION

Satisfaction	1	2	3	4	5
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Developer Layout(Fig 4.)	-	-	8 people	2 people	12 people
Modified Layout(Fig 5.)	6 people	7 people	5 people	2 people	2 people

According to that table, a lot of people choose a good design experience for Fig 4. as a developer layout (54.5% people choose very good), (9.1 % people choose good), (36.4% people choose average). Nevertheless, modified layout gives several kinds of recognitions (27.3% people choose very bad), (31.8% people choose bad), (22.7% people choose average), (9.1% people choose good) and (9.1% people choose very good). Most of them hated the modified layout, and only a few people choose a modified layout (Fig 5.) for the best UI/UX design mobile game. Furthermore, we asked that 4 people who choose a modified design as a best layout to give us a reason; for the first minute they tried, they hated this layout, but after focused and tried to play, this was the best layout for them. However, 6 people also said they can play with both of that layouts without any issues.

Thus, we have processed all data from 2 stages of experiment, and the mean score from;

Fig 4. (original developer layout) is 4.18 / 5.00

Fig 5. (modified layout) is 2.41 / 5.00

According to the result data, design Fig 4. from original developer is better than Fig 5. with modified layout. It means, most of left-hand-dominant people choose original developer layout for them. We found that the relation between user interface and user experience mobile game application towards the processing of game activities according to hand dominance. Left-hand-dominant people can be able to adapt with different situation. Because when they try to play mobile games with MOBA or Battle Royale's TPS genre (with basic normal layout), their right- hand has been forced to move quickly and need to press a correct spot (i.e., button) on the screen, but at daily life, they use left-hand for several things like writing, cooking, etc. Furthermore, in game environment, their left-hand only for control movement of game character, which is easier than their right-hand.

We also got suggestion from our participants, they were considering about the game character also need to use same dominance hand with their user. They believe, not only game interface but also game character must refers to them. It means, if user is right-hand-dominant, the game character also must be right-handers, and if user is left-hand- dominant, the game character also must be left-handers. However, PUBG Mobile just give right-handers character while we swap the interface buttons position from right to left side.



Fig 7. Right-hander PUBG mobile game character

Thus, according to the questionnaire result from our experiment, we cannot generally give a best layout for every user with left-hand-dominant people, because they have a different style and experience towards UI/UX game design. We suggest developer game like MOBA or Battle Royale TPS genre always give feature possibility for any player to customize their layout buttons.

*PUBG Mobile can customize user interface game buttons*  
Not all games allow players to customize about user interface buttons, but we found PUBG Mobile (PlayerUnknown's Battleground) gives 3 basic suggestions and also customize option for that every layouts.



Fig 8. Customize controls option PUBG mobile



Fig 9. Customize buttons design screen PUBG mobile

PUBG mobile gives possibility to their player for change position, size and transparency every buttons in the game environment. This feature is a very good solution not only for left-hand-dominant player, but also right-hand-dominant player who want another layout for their game button interface. Because we believe, every gamer is unique, therefore we need to consider “customize feature option” is the best solution design for all.

#### V. ACKNOWLEDGMENT

Thanks to PUBG Mobile (PlayerUnknown’s BattleGround) as a sample game model. Game screenshot has taken from PUBG mobile game application. We downloaded this mobile game from app store Indonesia region, Copyright © PUBG Corporation. Lightspeed & Quantum Studios. Published by Tencent Games.

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