



Faculty of Cognitive Sciences and Human Development

**COMPARING USERS' TYPING PERFORMANCE IN TOUCH SCREEN
DEVICE (SMARTPHONE) BASED ON QWERTY KEYBOARD
LAYOUT AND SCREEN SIZE**

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**COMPARING USERS' TYPING PERFORMANCE IN TOUCH SCREEN DEVICE
(SMARTPHONE) BASED ON QWERTY KEYBOARD LAYOUT AND SCREEN SIZE**

NATASHA JULIA ANAK NYANDANG

This project is submitted in partial fulfillment of the requirements for a
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The project entitled ‘Comparing Users’ Typing Performance in Touch Screen Device (Smartphone) Based on QWERTY Keyboard Layout and Screen Size’ was prepared by Natasha Julia anak Nyandang and submitted to Faculty of Cognitive Sciences and Human Development in partial fulfillment of the requirements for a Bachelor of Science with Honours (Cognitive Sciences)

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ABSTRACT

The utilization of the touch screen technology especially in smartphones are ubiquitous and have attracted many attention in today's era. Regardless of the worldwide usage of the touch screen device (smartphone), the text entry in the device must meet the users' expected performance despite of the different QWERTY keyboard layouts and also the screen sizes of device. Therefore, this study intended to compare users' typing performance in touch screen device based on QWERTY keyboard layout and also screen size. The study were participated by 60 participants of the end users of touch screen device (smartphone) in Universiti Malaysia Sarawak for the typing task experiment. The results indicates that the soft QWERTY keyboard gives a higher typing speed than the gesture based QWERTY keyboard while the gesture based QWERTY keyboard gives a higher typing accuracy than the soft QWERTY keyboard. Meanwhile, or the screen size, the large screen size of the touch screen device (smartphone) gives a higher typing speed and also typing accuracy than the small and medium screen sizes. The discussion of the findings were discussed regarding the factor that contribute in the differences between users' typing performance.

Keywords: Touch screen technology, smartphone, typing performance, QWERTY keyboard, screen size.

ABSTRAK

Penggunaan teknologi skrin sesentuh terutamanya dalam penggunaan telefon pintar telah mendapat perhatian di seluruh global dan meraih nama dalam teknologi dunia terkini. Walaupun sedemikian, entri teks dalam telefon pintar seharusnya memenuhi prestasi yang dijangka oleh pengguna telefon pintar tersebut meskipun berbeza jenis papan kekunci dan juga saiz skrin. Oleh sebab itu, kajian ini bertujuan untuk memandingkan prestasi pengguna dalam jenis papan kekunci yang berbeza dan juga saiz skrin yang berbeza dalam telefon pintar. Kajian ini telah disertai oleh 60 responden yang terdiri daripada pengguna telefon pintar di Universiti Malaysia Sarawak untuk uji kaji menaip. Hasil daripada uji kaji tersebut, kajian ini mendapati bahawa papan kekunci sesentuh mempunyai kadar penaipan yang tinggi berbanding dengan papan kekunci sesentuh yang menggunakan pergerakan dan papan kekeunci sentuh yang menggunakan pergerakan mempunyai kadar penaipan yang betul daripada papan kekunci sentuh. Tambahan pula, untuk saiz skrin, saiz skrin telefon yang lebar mempunyai kadar penaipan yang tinggi dan juga kadar penaipan yang betul. Semua faktor-faktor yang mempengaruhi keputusan kajian ini dibincangkan dan dikonklusikan dalam perbincangan kajian ini.

Kata kunci: Teknologi skrin sesentuh, telefon pintar, prestasi penaipan, papan kekunci, saiz skrin.

CHAPTER ONE

INTRODUCTION

Introduction of the Study

According to Rouse (2014), a smartphone is defined as a portable device with sophisticated features that resembles computer-like features such as emails, web browsing and much other software. A smartphone uses touch screen technology. Basically, a smartphone is like a computer that is in a compact size that users can bring anywhere they desired to. The sizes are in three distinct sizes, which are small, medium and large.

From the earlier version of smartphone, the main input device to enter or for text entry are the keyboard is itself. The first version of smartphone uses a physical QWERTY keyboard for text input and inquiry (Clawson, Clarkson, Lyons, & Starner, n.d). After that, the revolution of smartphone revolves with the technology that the world has known. “The way in which humans interact with technology is one of the most important ways technology is changing” (Hoye & Kozak, 2010). The very first smarphone that uses the soft keyboard or the virtual keyboard was released in the year of 2007 (Miyashita, 2012), which the Iphone. In this era, the smartphone offers more features that allow user’s interactivity with the device. For an example, the smartphone now allows user to reply their emails. Apart from that, this era of smartphone offers internet connectivity (Miyashita, 2012) that enables user to connect with different types of media and indirectly, users would interacts with the device (smartphone) as the smartphone gives feedback for every action that the users’ perform.

Eventhough the current smartphones offers more and advanced features from the previous older version of smartphone, however, the main component of the smartphone for entering data or text inquiry is still the keyboard (Azenkot & Zhai, 2012). As now the current designed keyboard that is used in smartphone is the soft or the virtual keyboard. The touch area of the QWERTY keyboard is determined by the touch screen device's size and it affects the touch screen keyboard design (Go & Endo, 2008). Bhalla and Bhalla (2010) defined touch screen technology as “a touchscreen is an electronic visual display that can detect the presence and location of a touch within the display area.”

“By using touch screen technology, the user is able to manipulate a digital environment by only the touch of their finger, or another input device, on the screen” (Hoye & Kozak, 2010).



Adapted from Teknoloji transfer ofisi, n.d, Retrieved from
<http://aibuttmer.ibu.edu.tr/otomasyon/>

Figure 1.1. Touch screen technology

Figure 1.1 gives the illusion of the touch screen device that are currently leading the world's most popular technology among all users.

Therefore, even though the smartphone offers much features that fulfill the user's needs in different perspective, but the one thing that users are often find that is difficult to do is typing with the soft or the virtual keyboard of the smartphone.

Background of the study

Firstly, the background of the study consist if a few previous studies done by researcher. In the context of the current study, the previous study acts as references and guidelines in every important aspects of the study.

Go and Endo (2008) described that the typing performance of users depends on five different factors which are screen size, touchscreen keyboard types, number of keys, typing device and also techniques. According to Go and Endo (2008) the typing performance are determined based on users' typing speed and also users' typing accuracy.

In relation to the current study, the current study continues the two mentioned factors of Go and Endo (2008) study, which are screen size and also the touchscreen keyboard types. However, the current study is significantly different with Go and Endo (2008), as the current study only compares the typing performance based on QWERTY keyboard layouts and also the screen size of the smartphone. The previous study acts as guidelines and also the backbone of the current study.

Meanwhile, for Azenkot and Zhai (2012) study, the two researchers studied the typing performance based on touch behaviour of users. The touch behaviour of the users indicates the postures of the gripping of the touch screen device. However, in the context of the current study, one of the limitation of the current study is that the touch behaviour of users are not precisely mentioned as the touch behaviour is not considered as the main factors for typing performance. Therefore, Azennkot and Zhai (2012) study are referred in terms of the typing entry in using different keyboards.

As a conclusion, all of the mentioned studies are carefully referred and read as the previous study helps in giving guidelines for the current study in terms of methodology, problem statements, objectives and many more.

Problem Statement

According to Merriam-Webster (2014), a QWERTY keyboard is defined as a benchmark of typewriter or computer layout that is mostly used by users. In the context of smartphones, the QWERTY keyboard that currently in used are the virtual and soft keyboard. However eventhough the usage of soft keyboard are popular among users, there are some issues that arise related to the soft keyboard.

Nowadays, as the technology speeds up with the current and latest trend of touch screen devices, designers often forgotten to emphasize on how the design would influences user's performance in using that device. Smartphones now are no longer using the physical QWERTY keyboard and the size of the keyboard varies according to the screen size of the smartphones.

According to Azenkot and Zhai (2012), text entry in using touch screen technology such as smartphones constantly remained slower and more prone to make typing and also spelling errors. Therefore, the problem statement of this study is similar as Azenkot and Zhai studies as now, the typing speed and typing accuracy is still the main drawbacks of touch screen technology. “For as much as mobile apps have sped up our lives, there’s still nothing slower than touch-screen typing” (Redmon, 2013).

Typing performance of users’ gives a big impact towards the usability of the device. Here, in the context of the current study, the typing performance of users need to be improved and enhanced because the performance would automatically reflects the usability of typing in touch screen device.

Research Objectives

The objectives of this study are divided into two which are the general objective and also the specific objective.

General Objective

To compare users’ typing performance in touch screen device (smartphones) based on QWERTY keyboard layout and screen size.

Specific Objectives

There are four specific objectives which are:

- i. To compare users' typing speed in using two different QWERTY keyboard layout (Soft keyboard and Gesture-Based Keyboard).
- ii. To compare users' typing accuracy in using two different QWERTY keyboard layout (Soft keyboard and Gesture-Based keyboard).
- iii. To compare users' typing speed in three different screen size of smartphones (small, medium, large).
- iv. To compare users' typing accuracy in three different screen size of smartphones (small, medium, large).

Research Questions

The research questions are based on the objectives above. Therefore, the research questions consist of four questions;

- i. Which QWERTY keyboard layouts gives the high rate of typing speed?
- ii. Which QWERTY keyboard layouts gives the high rate of typing accuracy?
- iii. Which screen size of smartphones gives the high rate of typing speed?
- iv. Which screen size of smartphones gives the high rate of typing accuracy?

Research Hypothesis

The research hypothesis consists of two which are the null hypothesis and the non-directional hypothesis.

Null Hypothesis

h01: There is no significant difference in users' typing speed in using soft QWERTY keyboard.

h02: There is no significant difference in users' typing speed in using gesture-based QWERTY keyboard.

h03: There is no significant difference in users' typing accuracy in using soft QWERTY keyboard.

h04: There is no significant difference in users' typing accuracy in using gesture-based QWERTY keyboard.

h05: There is no significant difference in users' typing speed in using small screen size of smartphones.

h06: There is no significant difference in users' typing speed in using medium screen size of smartphones.

h07: There is no significant difference in users' typing speed in using large screen size of smartphones.

h08: There is no significant difference in users' typing accuracy in using small screen size of smartphones.

h09: There is no significant difference in users' typing accuracy in using medium screen size of smartphones.

h010: There is no significant difference in users' typing accuracy in using large screen size of smartphones.

Non-Directional Hypothesis

ha1: There is a significant difference in users' typing speed in using soft QWERTY keyboard.

ha2: There is a significant difference in users' typing speed in using gesture-based QWERTY keyboard.

ha3: There is a significant difference in users' typing accuracy in using soft QWERTY keyboard.

ha4: There is a significant difference in users' typing accuracy in using gesture-based QWERTY keyboard.

ha5: There is a significant difference in users' typing speed in using small screen size of smartphones.

ha6: There is a significant difference in users' typing speed in using medium screen size of smartphones.

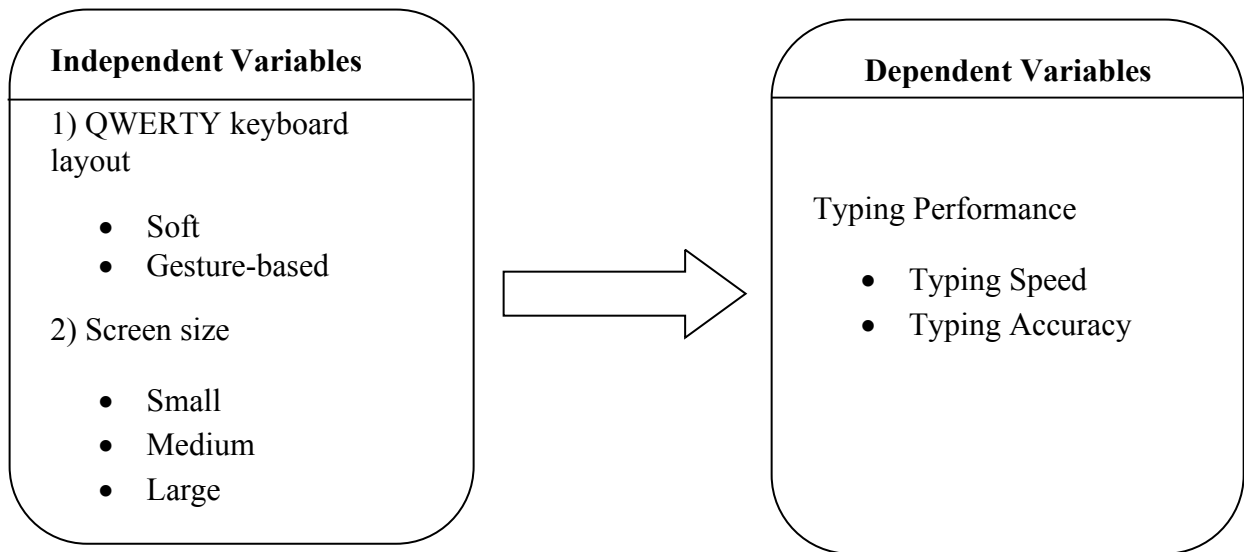
ha7: There is a significant difference in users' typing speed in using large screen size of smartphones.

ha8: There is a significant difference in users' typing accuracy in using small screen size of smartphones.

ha9: There is a significant difference in users' typing accuracy in using medium screen size of smartphones.

ha10: There is a significant difference in users' typing accuracy in using large screen size of smartphones.

Conceptual Framework



Definition of Terms

All of the terms that are used in this study are defined by conceptual and also operational. According to Merriam Webster online dictionary (2014), conceptual definition is defined as the scientific definition of a variable based on textbooks or theories. Meanwhile, according to Research Methods (1999), operational definition is defined as how the term will be measured in the study.

Conceptual terms

- i. Touch screen: “An electronic virtual display that detects the presence and location of a touch within the display area” (Bhalla & Bhalla, 2010).
- ii. Performance: “Perceived usability of text entry” (Go & Endo, 2008).
- iii. QWERTY Keyboard: “A standard smartphone text entry method” (Azenkot & Zhai, 2012).
- iv. Screen Size: “Resolution of such touch screen”(Henze, Rukzio, & Boll,2012).

Operational Terms

- i. Touch screen: The touch sensitivity of the screen while typing.
- ii. Performance: Users’ typing speed and typing accuracy based on the layouts of the keyboard and also screen size of smartphones.
- iii. QWERTY Keyboard: The capabilities of users to use QWERTY keyboard for text entry.
- iv. Screen Size: The different sizes of the smartphones’ screens.

Significance of the Study

The purpose of this study to be conducted is to enhance users’ typing performance by determining which keyboard layout gives the best typing speed and also typing accuracy across three different screen sizes of smartphones.

Scope of the Study

The scope of the study focuses on comparing users' typing performance based on two factors which are the two layouts of the QWERTY keyboards which are the soft QWERTY keyboard and also the gesture-based keyboard and also different screen sizes of the smartphones used. Therefore, the scope of the study focuses on the two factors and other factors that have possibilities contributing towards typing performance is not significant to the study.

CHAPTER TWO

LITERATURE REVIEW

Ergonomics

Ergonomics is a field designed to help and assists any product users either in workplaces, or homes. Furthermore, ergonomics is also a field that retains the productivity, the effectiveness, efficiency, and safety while users performed their work respectively (White, 2008). According to International Ergonomics Association as cited in Cañas, Velichkovsky & Velichkovsky, n.d, ergonomics is defined as “... the scientific discipline that deals with understanding the interaction between humans and other elements of a socio-technical system”

In addition to that, ErgoWeb Inc as cited in White, 2008, describe ergonomics as “Ergonomics removes barriers to quality, productivity, and safe human performance in human-machine systems by fitting products, equipment, tools, systems, tasks, jobs, and environments to people”. Ergonomics basically help in overcome human limitation by providing an alternative design or designing a product that fulfill human basics needs and adapting human constraint or factors in the consideration of the designing process.

Ergonomics are divided into four main components which are:

- Physical Ergonomics
- Cognitive Ergonomics
- Neuroergonomics
- Social or Organizational Ergonomics

Therefore, the types of ergonomics are explained one by one in the following paragraph.