Faculty of Information and Communication Technology

DYCScreen – Cross-Platform Dyslexia Screening Test for Malaysian Children through Hybrid Applications

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Master of Computer Science (Software Engineering and Intelligence)

2015
DYCSCREEN – CROSS-PLATFORM DYSLEXIA SCREENING TEST FOR MALAYSIAN CHILDREN THROUGH HYBRID APPLICATIONS

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A thesis submitted
in fulfillment of the requirements for the degree of Master of Computer Science
(Software Engineering and Intelligence)

Faculty of Information and Communication Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2015
DECLARATION

I declare that this thesis entitled “Dycscreen - Cross-Platform Dyslexia Screening Test For Malaysian Children Through Hybrid Applications” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : ......................................................
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Date : 22 January 2015
I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of Master of Computer Science (Software Engineering and Intelligence).

Signature : .................................................................

Supervisor Name : Dr. Ahmad Naim Bin Che Pee @ Che Hanapi

Date : 22 January 2015
DEDICATION

To my beloved grandparents, parents and siblings
ABSTRACT

This study is carried out to identify potentially dyslexics among children in Malaysia. Identifying dyslexics among the children in Malaysia has been a difficult task. This is due to lack of comprehensive screening tests in Malaysia and most of the available screening tests are expensive. Indicators of dyslexia are differs for specific age groups, for instance, the identification for children is focusing more in problems learning the alphabets, numbers, shapes and colors. The identification for adults is however more advance in which the focus would be in terms of the written works and achievements in studies. The existing screening test applications from overseas such as Direct Learning Educational Assessments, Lucid and Pearson are expensive while the free applications are incomprehensive and lacking of useful features. The screening test will be developed using hybrid applications approach as it provides cross-platform access which allowed users to conduct the screening test according to their preference either through personal computers, desktops, or mobile devices. Initial study shows that currently in Malaysia, there is no screening test which developed using hybrid applications approach. The conventional approach requires the person to perform manual screening test conducted by the expert at the Dyslexia Centres to confirm the disabilities and some fees will be charged. Having a localized screening test is crucial as Malaysian education system is differs from other countries. Hence, it is important for individuals to indicate whether they are dyslexics because many of them suffered in studies without knowing that they are actually dyslexics. Dyslexics can have a better opportunity in life if they were given early remediation, intervention, and support from corresponding society. Identifying dyslexics does not only benefit the dyslexics but also to guardians and countries.
ABSTRAK

ACKNOWLEDGEMENTS

In completing this research, I have received a lot of assistance from my supervisor, expert, family and also my fellow friends. Firstly, I would like to give my upmost thanks to my supervisor, Dr. Ahmad Naim Bin Che Pee @ Che Hanapi for teaching, guiding and supporting me through the completion of this research. Besides, I would like to give my earnest appreciation to my family for supporting me all the time until the completion of this research. Also, not forgetting my friends who have been a great source of support and help, I would like to address my gratitude and appreciation to them. Moreover, I would like to thanks the expert, tutor and students who spent their precious time in the research testing. Without them, this research would not be a success. Special thanks to them.

Finally, I would like to give my biggest and sincerest thanks to God for giving me the strength and intelligence in order for me to produce the best outcomes for my master research.
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LIST OF ABBREVIATIONS

ANN - Artificial Neural Network
DycScreen - Dyslexia Children Screening
ICT - Information and Communication Technology
MySQL - Structure Query Language
OS - Operating System
PC - Personal Computers
QR code - Quick Response Code
SPD - Specific Learning Disability
URL - Uniform Resource Locator
UTeM - University Technical Malaysia Malacca
CHAPTER 1

INTRODUCTION

1.1 Research Background

Dyslexia is known as a specific learning disability (SPD) of neurological origin which affects the ability or capability to process written and sometimes even spoken language (Gaggi et al, 2012). Dyslexia is a lifelong condition for which it is neither a sickness nor disease and therefore cannot be cured. The symptoms of dyslexia are ranging from mild to severe. However, depending on the degree or severity, there are appropriate remedial programs and compensatory strategies available which can assist dyslexics to overcome the difficulties. According to Gaggi et al (2012), dyslexia is often a cause of school failure and significantly affects the individuals’ education, as well as being an important risk factor for the development of more complex psychopathological disorders such as behavior disorder, anxiety, and depression. Dyslexia is generally inherited and not the outcome of race or social background, sensory impairments, or learning a second language and is independent of intelligence, although those reasons can lead the individuals to the risk of inability to read (Catherine et al, 1998).
Likewise, individuals with dyslexia in a multi-cultural country such as Malaysia commonly exhibit more difficulties in reading, spelling and writing since Malaysian are expected to master more than one language. To date, there is no concrete data and research evidence on the prevalence of children dyslexics in Malaysia. However, there was a pilot study conducted by Gomez (2004) in a primary school of 2000 students revealed that in Standard 2 Malay students, 7% of the students are identified to be dyslexics. Moreover, according to an article in The Star, there is an estimated of 314,000 dyslexics in Malaysia (Wong, 2009). This implies that most dyslexics are not getting assistance from corresponding society or given public awareness. Although there are successful individuals with dyslexia, many individuals with dyslexia do not make it to higher studies or acquire the necessary skills to cope with adult life challenges. In fact, some of them contribute to social problems.

In recent years, mobile devices, generally represented by smartphones and tablets are becoming a trend, used by millions of people across the world. Compared to conventional approaches, these devices are able to offer a more flexible inclusive approach to support students with disabilities, particularly dyslexia with the gain of mainstreaming assistive technology without the loss of personalization (Kondo and Nakamura, 2009). Mobile applications, sometimes referred to as mobile apps or apps are application software developed to run on devices such as smartphones and tablets. Typically, the apps are downloaded from the platform to a target device, such as Android phone, Windows Phone, iPhone or BlackBerry. The common platforms for downloading the apps are Google Play App Store, Apple App Store, BlackBerry App World and Windows Phone App Store with the Google Play App store alone having 700,000 apps at the end of 2012 (Rosen, 2012).

In the last two decades, digital technology, particularly Personal computers (PC) have played a vital role in supporting remediation and enhancing skills. For instance, the
The digitization of text with the introduction of e-books has made it possible for dyslexics students to read books using text-to-speech software (Elkind, 1993). Nevertheless, due to the problems such as high cost, the bulky size on the desk, increase electric power supply and slow startup or powering up tend to make it difficult to use in many situations especially in classrooms. Despite of that, teachers may struggles or face difficulties when using the computer based assistive technologies.

However, depending on preference and needs, some users might prefer to conduct the dyslexia screening test via the personal computers or desktop due to the large screen which make it more interactive. On the other hand, some users might prefer to conduct the screening test via mobile devices particularly because mobile devices are designed to be handheld which allowed the users to conduct the screening at anytime, anywhere.

Hence, in order to satisfy the preference and needs of users, hybrid apps approach is introduced. Hybrid applications or sometimes referred to as hybrid apps is a native mobile apps which uses a native ‘shell’ approach to wrap the contents on the web. A hybrid apps is written similarly with the web technologies approach such as HTML5, CSS and JavaScript. The hybrid apps are then installed through the app store, or scan through the Quick Response Code (QR code) in order to provide privileged access to run inside a native container on mobile devices. Besides, instead of developing the application using native SDK, hybrid apps work by wrapping the web application through a native web view controller full screen, which indirectly declined normal browser controls and address bar. To simplify, hybrid apps approach indirectly provides cross-platform access which allowed users to conduct the screening test according to their preference either through personal computers, desktops, or mobile devices. This study aims to identify potentially dyslexics among children in Malaysia.
through hybrid apps approach. Apart from that, this research also intends to capture more data about the prevalence of children dyslexia in Malaysia.

1.2 Problem Statements

People nowadays have lack of awareness about the symptom Dyslexia. Therefore, most of them do not acknowledge that their family members, friends and may be themselves are actually dyslexics. They tend to underestimate those who seem to be different from them without knowing that those who have difficulties in learning might actually be dyslexics. Limited knowledge about dyslexia from parents, teachers and society cause these dyslexics not to have early attention. Thus, most of these dyslexics growing up with low self-esteem and have tendency to be violence as they thought they are different from normal individuals. These dyslexics can have a better opportunity in life if they were given early remediation, intervention, and support from corresponding society.

Likewise, most of the dyslexia screening tests were developed according to western countries education systems which is differ from Malaysia education systems. Having a localized screening test is crucial as Malaysian educational experts have much effort in promoting and developing the skills of reading and interpreting. Besides, the license for existing screening tests are expensive and only a few learning institutions could afford to subscribe. Moreover, screening tests in market nowadays are mostly in the form of questionnaires. Users need to answer a series of questions and will be evaluated based on their answers. However, these tests do not include test such as vision, verbal and cognitive test. On the other hand, conventional methods used for screening dyslexia such as paper-based
approach are tedious, inefficient and unsystematic which often resulted in data lost. Similarly, a more advance method such as using Personal Computer (PC) as a platform for screening also create problems such as high cost, bulky size on the desk, increase electric power supply and slow startup or powering. In addition, mobile devices have several drawbacks as well. This is particularly due to the small screen size which often leads to lack of interactivity. Another main concern of using mobile devices is the limited power supplies. Processor, display and network connectivity are the main power consumers in mobile device.

1.3 Research Objectives

i) To design and develop dyslexia screening test using Hybrid applications approach.

ii) To investigate potentially dyslexics among children in Malaysia.

iii) To evaluate the suitability of using cross-platform applications for detecting dyslexics.
1.4 Research Scope and Limitation

This section will describe about the target users, type of tests, type of mobile application development approach and supported platform in this study.

1.4.1 Target Users

Indicators of dyslexia are differs for specific age groups, for instance, the identification for children is focusing more in problems learning the alphabets, numbers, shapes and colors. The identification for young adults is however more advance in which the focus would be in terms of the written works and achievements in studies. This research is primarily subjected to Malaysian children age between 9 to 12 years old as this study requires the child to have possessed reading ability.

1.4.2 Type of Tests

There are two types of tests for indicating dyslexia namely screening test and comprehensive test. Screening test is conducted in order to narrow down the large group of individuals who might need a more thorough test for possible dyslexia whereas comprehensive test is conducted in order to determine what type of dyslexia a person might have and the level of problems that arise. As this study aims to identify potentially dyslexics among children in Malaysia, this study will only cover screening test.
1.4.3 Type of Mobile Application Development Approach

There are several types of mobile application development approach namely Native Mobile Apps, Mobile Web Apps and Hybrid Apps. Native mobile apps are designed to run the programs directly on a device. However, the code written for a particular platform is unable to be tailored in another platform. On the other hand, Mobile web apps are designed to run in the device’s browser and can be operated across all the platforms. Despite of that, Mobile web apps offered less convenient features compared to native apps. In addition, Hybrid apps are designed as a cross between Native app and Mobile web apps. It is wrapped in a platform-specific shell which provides features such as cross-platform adaptability, native installation, full device integration and app store distribution. Hence, due to the features provided, the Dyslexia screening test will be developed using Hybrid apps approaches.

1.4.4 Supported Platform

As Hybrid Apps are wrapped in a platform-specific shell which provides features such as cross-platform adaptability, this application is supported by Android and Windows Phone. Other platform such as IOS, Blackberry and webOS are not supported due to the free version of Adobe Phonegap Builder. Despite of that, this study is targeted to Android users due to the rapid market growth since 2009. Figure 1.1 shows the global smartphone sales to end users from 2009 to 2013 whereas Figure 1.2 shows the global market share by smartphone operating systems from 2009 to 2013.