Faculty of Information and Communication Technology

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

Leong Pui Huang

Master of Computer Science (Software Engineering and Intelligence)

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

LEONG PUI HUANG

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

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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 : .....

Name : Leong Pui Huang

Date : 22 January 2015

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APPROVAL

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

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DEDICATION

To my beloved grandparents, parents and siblings

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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.

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ABSTRAK

Kajian ini dijalankan untuk mengenal pasti kanak-kanak yang berpotensi dislexic di Malaysia. Mengenal pasti dislexic di kalangan kanak-kanak di Malaysia merupakan tugas yang sukar. Hal ini disebabkan kekurangan ujian pemeriksaan yang menyeluruh di Malaysia serta kebanyakan ujian yang sedia ada adalah mahal. Ujian disleksia adalah berbeza berdasarkan kelompok umur yang tertentu , misalnya , pengenalpastian untuk kanak-kanak lebih tertumpu dalam masalah pembelajaran huruf, nombor, bentuk dan warna. Pengenalpastian untuk orang dewasa lebih tertumpu kepada kerja-kerja penulisan dan pencapaian dalam akademik. Aplikasi ujian yang sedia ada dari luar negara seperti Lucid dan Pearson adalah mahal manakala aplikasi yang percuma adalah tidak lengkap dan kekurangan ciri-ciri yang berguna. Ujian ini akan dibangunkan dengan menggunakan pendekatan hibrid kerana ia menyediakan akses cross-platform yang membenarkan pengguna untuk menjalankan ujian mengikut pilihan mereka sama ada melalui komputer peribadi , komputer meja, atau peranti mudah alih. Kajian awal menunjukkan bahawa di Malaysia, tidak ada ujian yang dibangunkan menggunakan pendekatan hibrid. Pendekatan konvensional memerlukan individu tersebut untuk menjalankan ujian manual yang dikendalikan oleh pakar-pakar di Pusat Disleksia untuk pengesahan dan yuran akan dikenakan. Mempunyai ujian pemeriksaan tempatan adalah penting kerana sistem pendidikan di Malaysia adalah berbeza dengan sistem pendidikan di negara asing. Oleh itu, adalah penting bagi individu untuk mengenal pasti sama ada mereka merupakan disleksic kerana ramai di antara mereka yang menderita tanpa mengetahui bahawa mereka sebenarnya dislexic. Dislexic boleh mempunyai masa depan yang cerah sekiranya mereka diberikan pemulihan awal dan sokongan daripada masyarakat. Mengenal pasti dislexic bukan sahaja memberi manfaat kepada individu dislexic tetapi juga untuk penjaga dan negara.

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TABLE OF CONTENTS

DECLARATION ..... **i**
APPROVAL ..... **ii**
DEDICATION ..... **iii**
ABSTRACT ..... **iv**
ABSTRAK ..... **v**
ACKNOWLEDGEMENTS ..... **vi**
TABLE OF CONTENTS ..... **vii**
LIST OF TABLES ..... **xi**
LIST OF FIGURES ..... **xii**
LIST OF APPENDICES ..... **xiv**
LIST OF ABBREVIATIONS ..... **xv**

CHAPTER 1 INTRODUCTION **1**
1.1 Research Background 1
1.2 Problem Statements 4
1.3 Research Objectives 5
1.4 Research Scope and Limitation 6
1.4.1 Target Users 6
1.4.2 Type of Tests 6
1.4.3 Type of Mobile Application Development Approach 7
1.4.4 Supported Platform 7
1.5 Research Significance and Contribution 9
1.6 Conclusions 10
CHAPTER 2 REVIEW OF LITERATURE AND STUDIES **11**
2.1 Introduction 11
2.2 Facts and Findings 12
2.2.1 Context of Dyslexia 12
2.2.1.1 Symptoms of Dyslexia 12

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2.2.1.2 Behaviour of Dyslexics 16
2.2.1.3 Level of Dyslexia 17
2.2.2 Conventional and Current Screening Test 18
2.2.3 Types of tests for Dyslexia 20
2.2.4 Dyslexia in Malaysia 22
2.2.5 Digital Technologies as a Tool to Assist Dyslexics 23
2.2.5.1 Existing Screening Tests 24
2.3 Conclusion 29
CHAPTER 3 RESEARCH METHODOLOGY 30
3.1 Introduction 30
3.2 Type of Research Method 30
3.3 Research Design 31
3.3.1 Define Problem Statement 32
3.3.2 Literature Review and Studies 33
3.3.3 Design and Development 33
3.3.4 Implementation 34
3.3.5 Analysis and Evaluation 34
3.4 Research framework 34
3.5 Research tools 36
3.5.1 Software Requirements 36
3.5.1.1 Adobe Dreamweaver CS6 36
3.5.1.2 Adobe Illustrator CS5 37
3.5.1.3 Adobe Photoshop CS5 38
3.5.1.4 Adobe PhoneGap Build 38
3.5.1.5 Microsoft Office Visio 2007 39
3.5.1.6 Microsoft Office 2010 39
3.5.1.7 MySQL 40
3.5.1.8 phpMyAdmin 40
3.5.2 Hardware Requirements 42
3.5.2.1 Workstation (Personal Laptop) 42
3.5.2.2 Mobile Device 42

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3.5.2.3 Printer 43
3.5.2.4 Mouse (computing) 43
3.6 Conclusion 44
CHAPTER 4 DESIGN & IMPLEMENTATION 45
4.1 Introduction 45
4.2 Preliminary Design 46
4.2.1 Pre-production Documentation 46
4.2.1.1 Storyboard Design 46
4.2.2 Screening Test Design 68
4.3 User Interface Design 70
4.3.1 Input and Output Design 70
4.3.2 Interaction Design 76
4.3.2.1 Error message box 76
4.4 Database design 77
4.4.1 Physical Database Design 78
4.4.1.1 Create Database 78
4.4.1.2 Create Table 79
4.4.2 Logical Database Design 80
4.4.2.1 Data Dictionary 81
4.5 Conclusion 81
CHAPTER 5 TESTING & ANALYSIS 82
5.1 Introduction 82
5.2 Test Plan 82
5.2.1 Test User 83
5.2.2 Test Environment 83
5.2.3 Test Schedule 84
5.2.4 Test Strategy 85
5.3 Test Implementation 86
5.3.1 Test description 86
5.3.2 Test data 87
5.3.2.1 Specific Learning Difficulties Expert 87

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5.3.2.2 Tutor....88
5.3.3 Test Result and Analysis....89
5.3.3.1 Specific Learning Difficulties Expert....90
5.3.3.2 Tutor....90
5.3.4 Analysis Testing....90
5.3.4.1 Analysis of Test Results from Students....91
5.3.4.2 Analysis of Test Results from Specific Learning Difficulties Expert....93
5.3.4.3 Analysis of Test Results from Tutor....95
5.4 Conclusion....97
CHAPTER 6 CONCLUSION....98
6.1 Observation on Weaknesses and Strengths....98
6.2 Proposition for Improvement....100
6.3 Contribution....101
6.4 Conclusion....102
REFERENCES 103
APPENDICES 108

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LIST OF TABLES

Table 2.1: Summary of The Symptoms of Dyslexia According to Age Group 15
Table 2.2: Summary of Conventional and Current Screening Test.....19
Table 2.3: Summary of Screening Tests versus Comprehensive Tests.....21
Table 2.4: Summary of Existing Screening Tools.....26
Table 3.1: Summary of Software Requirements 41
Table 3.2: Summary of Hardware Requirements 44
Table 4.1: Screening Test Categories.....69
Table 4.2: Input and Output Design 71
Table 5.1: Test Environment 84
Table 5.2: Test Schedule 85
Table 5.3: Test scale of Specific Learning Difficulties Expert 88
Table 5.4: Test scale of Tutor.....89
Table 6.1: The strengths and weaknesses of the application.....100

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LIST OF FIGURES

Figure 1.1: The Global Smartphone Sales 8
Figure 1.2: The Global Market Share by Smartphone Operating Systems 8
Figure 3.1: Research Design 32
Figure 3.2: Research Framework of the Website 35
Figure 3.3: The Multiscreen Preview Panel 37
Figure 4.1: Storyboard Design of index.html page for Desktop and Tablet 47
Figure 4.2: Storyboard Design of symptom.html page for Desktop and Tablet 48
Figure 4.3: Storyboard Design of screening_detail.html page for Desktop and Tablet 49
Figure 4.4: Storyboard Design of result.php page for Desktop and Tablet 50
Figure 4.5: Storyboard Design of help.html page for Desktop and Tablet 51
Figure 4.6: Storyboard Design of screening_questionnaires.html page for Desktop and Tablet 52
Figure 4.7: Storyboard Design of screening_spelling.html page for Desktop and Tablet 53
Figure 4.8: Storyboard Design of screening_vision.html page for Desktop and Tablet 54
Figure 4.9: Storyboard Design of screening_direction.html page for Desktop and Tablet 55
Figure 4.10: Storyboard Design of screening_math.html page for Desktop and Tablet 56
Figure 4.11: Storyboard Design of screening_result.php page for Desktop and Tablet 57
Figure 4.12: Storyboard Design of index.html page for Smart Phone 58
Figure 4.13: Storyboard Design of symptom.html page for Smart Phone 59
Figure 4.14: Storyboard Design of screening_detail.html page for Smart Phone 60
Figure 4.15: Storyboard Design of result.php page for Smart Phone 61
Figure 4.16: Storyboard Design of help.html page for Smart Phone 62
Figure 4.17: Storyboard Design of screening_questionnaires.html page for Smart Phone 63
Figure 4.18: Storyboard Design of screening_spelling.html page for Smart Phone 64
Figure 4.19: Storyboard Design of screening_vision.html page for Smart Phone 65

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Figure 4.20: Storyboard Design of screening_direction.html page for Smart Phone.....66
Figure 4.21: Storyboard Design of screening_math.html page for Smart Phone.....67
Figure 4.22: Storyboard Design of screening_result.php page for Smart Phone 68
Figure 4.23: The Empty Fill Message Box 76
Figure 4.24: The Empty Fill Message Box 77
Figure 4.25: The Database Created using phpMyAdmin.....79
Figure 4.26: Table Screening Created using MySQL 80
Figure 4.27: Data Dictionary for Table Screening 81
Figure 5.1: Test Results of Students.....91
Figure 5.2: Evaluation results by the Specific Learning Difficulties Expert.....94
Figure 5.3: Evaluation results by the Tutor 96

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LIST OF APPENDICES

APPENDIX A	Questionnaire Survey	108
APPENDIX B	Results of Test Scale	113
APPENDIX C	Coding of Table screening	117
APPENDIX D	Questions from Existing Systems	118
APPENDIX E	Screening Test Assessments	135
APPENDIX F	Interface Design Development	140

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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

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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 all, 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).

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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

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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

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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

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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.

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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.

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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.

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