Faculty of Applied and Creative Arts

INTERACTIVE DESIGN FOR UNIMAS BUS SCHEDULE

Lee Chiaw Mon

Bachelor of Applied Arts with Honours
(Design Technology)
2013

UNIVERSITI MALAYSIA SARAWAK
BORANG PENGESAHAN STATUS TESIS/ LAPORAN

JUDUL : Interactive Design for UNIMAS Bus Schedule

SESI PENGAJIAN: 2012/2013

Saya LEE CHIAW MON
(HURUF BESAR)

mengaku membenarkan tesis/ Laporan* ini disimpan di Pusat Khidmat Maklumat Akedemik, Universiti Malaysia Sarawak dengan syarat-syarat kegunaan seperti berikut:

1. Tesis/ Laporan adalah hakmilik Universiti Malaysia Sarawak
2. Pusat Khidmat Maklumat Akademik, Universiti Malaysia Sarawak dibenarkan membuat salinan untuk tujuan pengajian sahaja
3. Pusat Khidmat Maklumat Akademik, Universiti Malaysia Sarawak dibenarkan membuat pendigitan untuk membangunkan Pangkalan Data Kandungan Tempatan
4. Pusat Khidmat Maklumat Akademik, Universiti Malaysia Sarawak dibenarkan membuat salinan tesis/ laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi
5. *sila tandakan ☑

☐	**SULIT**	(mengandungi maklumat yang berdarjah keselamatan atau kepentingan seperti termaktub di dalam AKTA RAHSIA RASMI 1972)
☐	**TERHAD**	(mengandungi maklumat Terhad yang telah ditentukan oleh Organisasi/badan dimana penyelidikan dijalankan)
√	**TIDAK TERHAD**	

Disahkan

Tandatangan Penulis	Tandatangan Penyelia
Tarikh:	Tarikh:

Alamat Tetap:
169, Lorong 3,
Poh Kwong Park,
93150 Kuching,
Sarawak.

Catatan: * Tesis/ Laporan dimaksudkan sebagai tesis bagi Ijazah Doktor Falsafah, Sarjana dan Sarjana Muda
* Jika Tesis/ Laporan ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/ organisasi berkenaan dengan menyatakan sekali sebab dan tempoh tesis/ laporan ini perlu dikelaskan sebagai SULIT atau TERHAD.

INTERACTIVE DESIGN FOR UNIMAS BUS SCHEDULE

LEE CHIAW MON

This project is submitted in partial fulfillment of
the requirements for the Bachelor of Applied Arts with Honours
(Design Technology)

Faculty of Applied and Creative Arts
UNIVERSITI MALAYSIA SARAWAK
2013

DECLARATION

I certify that this dissertation is based on my original work except for the quotation and references which has been fully acknowleged.

....

(Lee Chiaw Mon)
Matric No: 23814

The project entitled **Interactive Design for UNIMAS Bus Schedule** is prepared by Lee Chiaw Mon and submitted to the Faculty of Applied and Creative Arts in partial fulfillment of the requirements for a Bachelor of Applied Arts with Honours Design Technology Programme.

Received for examined by :

………………………………….

(En. Azwan bin Abidin)

Supervisor

Date :______________________

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	**i**
TABLE OF CONTENTS	**ii**
LIST OF FIGURES	**vi**
LIST OF TABLES	**viii**
ABSTRACT	**ix**
ABSTRAK	**x**

Chapter 1 Introduction

1.0	Overview	1
1.1	Background Research	1
1.2	Problem Statement	3
1.3	Research Questions	3
1.4	Current Bus Schedule Information in Campus	4
1.5	Research Objectives	4
1.6	Scope of Study	5
1.7	Significance of Study	5
1.8	Limitation of Study	6
1.9	Summary	6

Chapter 2 Literature Review

2.0	Overview	7
2.1	Smartphone	7
2.2	Interaction Design	8
2.3	Mobile Application	8
2.4	Website	10
2.5	Summary	12

Chapter 3 Methodology

3.0	Overview	13
3.1	Primary Data	13
3.1.1	Observation	13
3.1.2	Interview	14
3.1.3	Questionnaires	14
3.1.3.1	Section A: Demographic background	14
3.1.3.2	Section B: General experiences and current Design	15
3.1.3.3	Section C: Interactive system recommendation	15
3.2	Secondary Data	15
3.3	Research Process	16
3.4	User Testing Strategy	18
3.5	Iterative Design	19

3.6 Summary 19

Chapter 4 Findings and Discussion

4.0 Overview 20

4.1 Data Analysis 20

4.1.1 Section A: Demographic background 21

4.1.2 Section B: General experiences and current design 22

4.1.3 Section C: Interactive system recommendation 28

4.2 Visual Analysis 34

4.3 Summary 36

Chapter 5 Proposal and Design

5.0 Overview 37

5.1 Mobile Application development process 37

5.1.1 Task Models 38

5.1.2 Paper Prototype 39

5.1.3 Usability Testing 40

5.1.3.1 Summary for usability testing 42

5.1.4 User Journey 43

5.1.5 Sitemap 44

5.1.6 Wireframe 45

5.1.7	Design and development	46
5.1.7.1	Software analysis- Adobe Illustrator	46
5.1.7.2	Software analysis- POP Prototype	51
5.1.8	Application and evaluation	52
5.1.9	Final product for mobile application	58
5.1.10	Summary for mobile application	59
5.2	Interactive Website creation process	60
5.2.1	System planning	61
5.2.2	Sitemap	61
5.2.3	Wireframe	62
5.2.4	System analyze & Design and development	63
5.2.4.1	Software analysis- Adobe Photoshop	63
5.2.4.2	Software analysis- Adobe Flash	64
5.2.4.3	Software analysis- Adobe Indesign	65
5.2.4.4	Software analysis- Adobe Dreamweaver	66
5.2.5	Application and evaluation	67
5.2.6	Web Browser	68
5.2.7	Summary for website	69
5.2.8	Final product for website	70
5.3	Summary	70

Chapter 6 Conclusion

6.0	Overview	71
6.1	Contribution of the research	71
6.2	Recommendations for future research	72
6.3	Summary for the research	72

REFERENCES 73

APPENDIXES 75

LIST OF FIGURES

Item		Page
Figure 1.1	Current bus schedule	4
Figure 1.2	Emergency happen	4
Figure 3.1	Research process diagram	16
Figure 3.2	User Testing diagram	18
Figure 3.3	Iterative Design Diagram	19
Figure 4.1	Mode of transport goes to class	22
Figure 4.2	Frequency of using UNIMAS bus	23
Figure 4.3	Bus arrival timing	24
Figure 4.4	Difficulties face by bus users	25
Figure 4.5	Mean of current bus schedule design	27
Figure 4.6	Percentage of interactive system	28
Figure 4.7	General experiences and information on respondents	29
Figure 4.8	Interface design on application	31
Figure 4.9	Feature of the application	32
Figure 4.10	Map display style	33
Figure 5.1	Model of development process, Richard and Steve	38
Figure 5.2	Task model showing the behavior a user adopts for Checking bus schedule	38
Figure 5.3	A hand-drawn paper prototype of a screen from an Application	39

Item		**Page**

Figure 5.4	Persona 1 with the user’s flow	40
Figure 5.5	Persona 2 with the user’s flow	41
Figure 5.6	User journey showing the key elements to include	43
Figure 5.7	Sitemap for the application	44
Figure 5.8	Sketch out the pages	45
Figure 5.9	Sketches for layout design	46
Figure 5.10	Various icons designed by researcher	47
Figure 5.11	Icon design specification	47
Figure 5.12	Interface design for *Bus Schedule*	48
Figure 5.13	Interface design for *Search*	49
Figure 5.14	Interface design for *Nearby*	49
Figure 5.15	Interface design for *Setting*	50
Figure 5.16	Linking with the “link spots”	51
Figure 5.17	Application of the interactive system	52
Figure 5.18	System evaluation and validation through audience	53
Figure 5.19	Means of system evaluation	54
Figure 5.20	System validation on “Application”	55
Figure 5.21	System validation on “Visual and Development”	56
Figure 5.22	System validation on “Interactive”	57
Figure 5.23	Final design for mobile application	58
Figure 5.24	Model of system development process	60

Item		Page
Figure 5.25	Sitemap at the early stage	61
Figure 5.26	Wireframe at the early stage	62
Figure 5.27	Web page layout design	63
Figure 5.28	Web banner design	64
Figure 5.29	Tutorial for the application	64
Figure 5.30	Interactive map in the webpage	65
Figure 5.31	Web page building	66
Figure 5.32	Web page launching	66
Figure 5.33	Means of system evaluation	67
Figure 5.34	Screenshot for webpage by Chrome browser	68
Figure 5.35	Screenshot for webpage by Internet Explorer browser	69
Figure 5.36	Final Product for website page	70

LIST OF TABLES

Item		Page
Table 2.1	Top 5 Features provided by four different foreign university websites	10
Table 2.2	Common features provided by ten different foreign cities/ Universities Bus mobile application	11
Table 4.1	Demographic data of the audiences	21
Table 4.2	Bad experiences face by bus users	26
Table 4.3	Elements of icon preferable by respondents	30
Table 4.4	Proposed icon preferable by respondents	34
Table 4.5	Proposed interface design for the application	35

Abstract

Bus Schedule is the primary information for the bus travelers. Excessively long waiting time at bus stops often discourages the travelers and make them reluctant to take buses. Thus, this study focused on the interactive design of bus schedule system at Universiti Malaysia Sarawak. In the study, problems statements currently face by passengers are identified through this research. “UNIMAS BUSES” is an application allows users to catch up to the bus schedule and be informed well of the next bus time.

In the meantime, the integration of data and visual design will be emphasis on the production of interactive design for both websites and Smart phones application. Findings and data collected were guided by the research objectives. Researcher derived from the findings and applies in the process of development. Usability aspects are presented especially for both medium. Validation will be performed to evaluate the effectiveness of the final application and website.

Abstrak

*Kajian ini fokus kepada reka bentuk interaktif untuk sistem jadual bas di Universiti Malaysia Sarawak. Dalam kajian ini, masalah kenyataan yang dihadapi oleh pengguna telah dikenal pasti melalui kajian ini. Penyelidik mereka bentuk interaktif untuk jadual bas UNIMAS untuk menyelesaikan menghadapi masalah dengan pengguna. "*UNIMAS BUSES*" adalah satu aplikasi yang membolehkan pengguna untuk menangkap sehingga jadual bas dan diberitahu juga masa bas yang seterusnya.*

Dengan itu, penemuan dan data yang dikumpul telah dianalisa dengan objektif kajian. Integrasi data dan visual diberi penekanan terhadap penghasilan reka bentuk interaktif untuk medium web dan app bagi telefon pintar. Aspek kebolehgunaan produk turut dititikberatkan. Validasi akan dilakukan untuk menilai keberkasanan produk akhir.

Chapter 1: Introduction

1.0 Overview

This chapter begins with a brief overview of interactive design and the background of the Universiti Malaysia Sarawak Transportation Unit. The problems statements currently face by passengers are identified through this research. With the problems, the research objectives are derived and closely related to the statement of the problem. Next, the research questions, and scope of the research are examined while the significance of the study and limitation of study is defines in the research.

1.1 Background Research

Universiti Malaysia Sarawak (UNIMAS) Transportation Unit was established in 1993. Unimas provides transportation air conditioned shuttle buses between hostels in campus and faculties, and locations out of campus and campus. Transportation Unit has provided several services which include academic purpose, faculty events, student's social program, hostel activities and so on. There were 25 trips for shuttle bus moving within campus every day. To cater the students' need, 4 shuttle buses will move for the route in campus whereas another 4 will move out of campus which is Desa Ilmu and Uni Garden.

Public transport is the first choice for the students who do not own a car. Undeniable, campus bus is the most convenient and affordable transportation for the students. However, bus time does not follow the published schedule. Unpunctuality and irregular bus arrival time indirectly brings some problems for the students in case of study, examination, time management and so on.

Fortunately, there's a fix for those summer rainstorm soggy shoes which will ensure you never wait for a bus again. This research is establishing the importance of time management which saves time from that nasty situation. Instead of waiting sweaty under a bus shelter crammed with people, the premise is to provide some basic alleviation from the pain of waiting bus.

As a rapid modern change, add the exponentially increasing users of Smartphone and things are bound to change, it is the time to converting visual printed timetable into interactive indicator to communicate bus schedule in the campus. Most people own mobile phones that are capable of browsing the Internet, taking pictures, and even knowing their current location. The advantage of interactive bus schedule on a mobile phone is the increased accessibility and usability. However, not every student affords to own a Smartphone. Thus, researcher will develop a website which can help students to track the bus movement as well. Another advantage is that students would not depend on PDF documents or paper printed tables anymore. This research has a potentiality save priceless time for waiting it at the stop and even visually pin-point the location of every incoming bus on map as well as an accurate estimate of arrival time.

1.2 Problem Statement

Bus schedule are mostly provided in two different forms, either as PDF documents distributed online, or as paper made timetables available at the bus stops notice board. However, these formats have two things in common, they are hard to navigate, lack of visual indicator to communicate and time consuming to use. Furthermore, the bus arrival time does not always followed as published timing and the operation times will not always coincide with students' schedule. Thus, there is lack of visual communication to inform passengers or students regarding to the bus delay, arrival time and the cancellation of bus movement. Hence, interactive bus schedule should be made available for devices that are ubiquitous, such as mobile phone and website.

1.3 Research Questions

The problem statement of the research generates research questions such as:

- What are the design criteria in combining printed bus schedule into interactive mobile application?
- How to communicate between bus passengers and the bus operator?
- What is the most effective way to inform passengers when there is bus delay or the cancellation of bus movement?

1.4 Current Bus Schedule Information in campus

PERUTUSAN
MAJLIS PERWAKILAN PELAJAR

ASSALAMU'ALAIKUM
DAN SALAM KEBITARAAN

Perhatian kepada seluruh Mahasiswa

Untuk makluman mahasiswa sekalian, berikut adalah laluan jadual perjalanan perkhidmatan bas MingguanDalam Kampus sepanjang Semester 1 Sesi 2012.

MASA SABTU	MASA AHAD DAN CUTI KELEPASAN AM	LALUAN DALAM KAMPUS
0800 0900 1000 1100 1200	0800 1000 1200	A1 P.INFO / ALLAMANDA / SAKURA / BHEP / CEMPAKA / WATER TOWER / P.INFO
TIADA BAS		
1400 1500 1600 1700 1800	1400 1600 1800	B1 P.INFO / BRC / TAZ / CAIS / BHEP / CEMPAKA / WATER TOWER / P.INFO
TIADA BAS		
2000 2100 2200 2300	2000 2200 2300	*SABTU – SETIAP SEJAM SEKALI *AHAD – SETIAP 2 JAM SEKALI
TAMAT		

**Sila hubungi *Unit Pengangkutan*, sekiranya tiada bas atau bas terlewat untuk mendapatkan maklumat lebih lanjut:
082-581388

Figure 1.1 Current bus schedule **Figure 1.2 Emergency happen**

1.5 Research Objectives

1) To identify the strength and weaknesses for current bus schedule
2) To analyze the feedback from users regarding to the bus indicator
3) To propose an interactive bus guide for bus passengers with estimated arrival time
4) To validate the application through users

1.6 Scope of Study

On top of this, the main focus of this research is the interactive schedule for the bus in UNIMAS on Smart phones application and website. This research is also focus on the usability and the flexibility of the mobile application for the users. Visual interface layout will be design for the users through search for nearby bus stop, bus location, arrival time as well as the emergency alert for the bus cancellation. Researcher will only focus on the bus schedule and the route information due to time constraint. The target audiences are focus on the UNIMAS students and the location area such as Desa Ilmu, and Uni Garden.

1.7 Significance of the Study

This research is to create an interactive design bus schedule for UNIMAS. The UNIMAS bus mobile application utilizes Smartphone devices and it is possible for a wider range of Smartphone users to use the application for their needs. Besides that, for those who do not have a Smartphone, website is also another option for them to access this application. The feature of this application allows users to check the bus schedule times, search function, nearby stops and setting for the application. This study overcome the inconvenient for the bus passengers and improve current version of printed format bus schedule.

1.8 Limitation of Study

Although the research has reached its aims, there were some unavoidable limitations. Developing an application is unique and complex production. It requires various expertise from different fields such as visual artist, programmer, project planner and etc. Thus, due to the limitation of time, this research will conducted only prototype for the bus schedule mobile application. However, researcher cares about those who do not own a Smartphone. Thus, researcher will create a website that can track the bus movement as well. Various technique and skills have to be explored and learn. Researcher also lack of knowledge on the coding and the programming system. Develop a complete mobile application by a single workface in such a short time is very difficult. It would be better if it has longer time. Apart from that, researcher will conducted this research within the campus compound due to the limitation of cost and distance.

1.9 Summary

Interactive UNIMAS Bus Schedule is an innovation of interactive application derived from the printed format bus schedule and it is closely follow the trend of technologies nowadays. Besides, Interactive bus schedule plays an important role to encourage two-way communication. Therefore, this research has a potentiality for smarter lifestyle at UNIMAS. And it is the first digital application on bus schedule among local universities.

Chapter 2: Literature Review

2.0 Overview

Chapter 2 discusses the literature review on the current technology in term of handheld device and some similar existing systems either in mobile application or related website. The reason looking for similar existing systems was to gather the typical features found in the mobile application and the website. Researchers look for variety references materials such as journals, articles, books and etc that are related to the topic of the study.

2.1 Smartphone

Smartphone describes phones with more advanced computing ability and connectivity than a contemporary feature phone, although the distinction can be vague and there is no official definition for what constitutes the difference between them. As cited in M.C.a.M. Commission, Editor (2007), "Without exception, Malaysia is one of the countries riding the wave of telecommunication evolution. Mobile phone usage in Malaysia has gained the ever increasing momentum. It is reported that 85% of Malaysians own mobile phone(s)". According May, H. and G. Hearn (2005), "most of the mobile phones nowadays are addressed as "Smartphone", as they offer more advanced computing power and connectivity than a contemporary mobile phone. Along with the smartphone fundamental capabilities to make voice call, video call, SMS, and MMS, smartphones have been repositioned as a "new information medium".

Based on the statistics shows by Wilska T.-A,(2003), "approximately 90% of the respondents are below 36 years old. This result is consistent to previous studies which found that majority of the smartphone users are teenagers and younger adults."

2.2 Interaction Design

According to Dan Saffer (2007), "Interaction design is the art of facilitating interactions between humans through products and services. Interaction design is by its nature contextual: it solves specific problems under a particular set of circumstances." (p. 4)

Interaction design is an applied art; its usefulness comes in its application to real problems. Its purpose is to foster communication-an interaction-between two or more human beings or, to a lesser degree, between a human and an artificial entity capable of responding in some manner, such as computer, mobile phone, or digital appliance. (Dan Saffer, 2007, p. 5)

2.3 Mobile Application

"Mobile applications or mobile apps are applications developed for small handheld devices, such as mobile phones, Smartphones, PDAs and so on. Mobile apps can come preloaded on the handheld device as well as can be downloaded by users from app stores or the Internet." Priya Viswanathan (2012).

To make a great mobile application, Josh Clark (2010) point out that "best apps give users elegant solutions to precise needs-the more focused, the better. App's