User Interface Factors that Influence the Adoption of *"Aplikasi Pangkalan Data Murid"*(APDM): A Case of Secondary Schools at Kubang Pasu Kedah.

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Abstrak

Pada masa kini, Sistem Maklumat Pelajar (SIS) atau dikenali sebagai Aplikasi Pangkalan Data Murid (APDM) telah digunakan secara meluas oleh sekolah serta mendapat perhatian para penyelidik dari pelbagai sudut dan isu. Sebelum menjalankan sebarang kajian mengenai penerima gunaan perisian terhadap pelaksanaan APDM, tindakan segera terhadap isu asas berkaitan dengan faktor yang mempengaruhi penggunaan APDM perlu dilakukan. Faktor penggunaan APDM yang sedia ada belum dibina dan diuji secara menyeluruh dalam perspektif teknikal (Antara Muka Pengguna: Skrin, Pembelajaran, Terminologi, Keupayaan Sistem), sosial (Tanggapan Kebergunaan, Tanggapan Kemudah gunaan), dan tingkah laku (Kepuasan Pengguna). Oleh itu, kajian ini bertujuan untuk mengenal pasti faktor penerima gunaan perisian yang mempengaruhi penerima gunaan APDM di sekolah menengah sekitar Kubang Pasu, Kedah. Satu tinjauan telah dijalankan ke atas 110 orang guru dari lima buah sekolah menengah yang berkenaan. Data dianalisis menggunakan ujian korelasi, analisis varian, dan regresi berganda. Dapatan kajian menunjukkan susun atur skrin APDM adalah faktor yang paling mempengaruhi secara signifikan ke atas Tanggapan Kebergunaan dan Tanggapan Kemudah gunaan. Tanggapan Kebergunaan juga adalah faktor yang paling tinggi mempengaruhi Kepuasan Pengguna terhadap APDM berbanding Tanggapan Kemudah gunaan. Kesimpulannya, para guru beranggapan bahawa susun atur skrin APDM adalah sangat berguna, mengandungi maklumat yang mencukupi, dan mudah untuk dikemudikan. Dapatan kajian ini boleh menyumbang kepada domain pendidikan dalam mengesyorkan kepada pembuat keputusan di Kementerian Pendidikan Malaysia (MOE) untuk penambahbaikan APDM pada masa akan datang.

Kata Kunci: Faktor Penggunaan Perisian, Antara Muka Pengguna, Tanggapan Kebergunaan, Tanggapan Kemudah gunaan, Kepuasan Pengguna

Abstract

Nowadays, Student Information System (SIS) also known as *"Aplikasi Pangkalan Data Murid* (APDM)*"* is widely used by many schools and getting attention by many researchers in various angles and issues. Before conducting any software adoption study on the implementation of APDM, an immediate action on the basic issues of the adoption factors that influence the APDM usage needs to be performed. The existing APDM adoption factors are not comprehensively constructed and tested in technical (User Interface: Screen, Terminology, Learning and System Capabilities), social (Perceived Usefulness, Perceived Ease of use), and behavioral (User Satisfaction) perspectives. Therefore, this study aims to identify the software adoption factors that influence the adoption of APDM in Kubang Pasu, Kedah secondary schools. A survey was conducted on 110 teachers from five secondary schools. Data were analyzed using correlation, analysis of variance and multiple regression tests. The findings show that the APDM screen layout is the most influential significant factor on Perceived Usefulness and Perceived Ease of Use. In addition, Perceived Usefulness is the most influential factor on User Satisfaction towards APDM as compared to Perceived Ease of Use. In sum, the teachers perceived that the APDM's screen layout was very helpful, contains adequate information, and easy to navigate. The findings may contribute to the educational domain particularly in recommending decision makers of the Ministry of Education Malaysia (MOE) for APDM future enhancement.

Keywords : Software Adoption Factors, User Interface, Perceived Usefulness, Perceived Ease of Use, User Satisfaction

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List of Abbreviations

APDM	*Aplikasi Pangkalan Data Murid*
BPPDP	*Bahagaian Perancangan dan Penyelidikan Dasar Pendidikan*
EG-HRMIS	Electronic Government Human Resources Management Information System
EMIS	Education Management Information System
EMR	Electronic Medical Records
E-SAS	Electronic Student Academic System
GUI	Graphic User Interface
ICT	Information and Communication Technology
IM	Information Management
IS	Information System
ISIS	Integrated Student Information System
IT	Information Technology
JPA	*Jabatan Perkhidmatan Awam Malaysia*
JPN	*Jabatan Pendidikan Negeri*
LMS	Learning Management System
MIS	Management Information System
MOE	Ministry of Education Malaysia
MP-TAM	Multiple Perspective Technology Acceptance Model
PEOU	Perceived Ease of Use
PG	*Pengurusan Guru*
PM	*Pengurusan Murid*
PPD	*Pejabat Pelajaran Daerah*
PS	*Pengurusan Sekolah*
PU	Perceived Usefulness
SAPS	*Sistem Analisis Peperiksaan Sekolah*
SIS	Student Information System
SMG	*Sistem Maklumat Guru*
SMIS	School Management Information System
SMM	*Sistem Maklumat Murid*
SMPP	*Sistem Maklumat Pengurusan Pendidikan*
SPS	*Sistem Pengurusan Sekolah*
SSDM	*Sistem Salah Laku Disiplin Murid*
SSMS	Smart School Management System
TAM	Technology Acceptance Model
TRA	Theory of Reasoned Action
UI	User Interface
UTAUT	Unified Theory of Acceptance and Use of Technology
QUIS	Questionnaire User Interface Interaction Satisfaction
XML	Extensible Markup Language

CHAPTER ONE
INTRODUCTION

1.1 Overview and Motivation

Nowadays, computer technology plays important roles in education worldwide. Habib Mat Som and Ahmad Kamaluddin Daud (2008) and Ohmae (1995) found that the development of Information Technology (IT) and globalization demolish the national borders in all sectors including education. Meanwhile, Adebayo and Fagbohun (2013) and Abolade and Yusuf (2005) have proven that Information and Communication Technology (ICT) leads as the fundamental tool in any educational system in the current century.

In addition, Mojgan Afshari, Kamariah Abu Bakar, Su, and Saedah Siraj (2012) have also proven that ICT influences the roles of transformational leadership in schools. Earlier, when technology was initially incorporated, Attaran and VanLaar (2001) discovered that school principals act as the technology leaders in influencing the use of presentation software, word processing, and spreadsheets in teaching and learning. The principals also make sure that they know the way to communicate with the broader community using internet applications. Hence, Felton (2006) and Mojgan Afshari et al. (2012) believe that school principals must possess computing capabilities to enable them to catch up with the dynamic progress of ICT in the digital era.

In Malaysia, the government has been very encouraging and supportive in using ICT to support and facilitate routine activities. In fact, Ministry of Education Malaysia (MOE) has been very aggressive in introducing the use of technology in education. For example, due to the requirements of the 21st -century learning environment, the MOE has come out with various policies and strategies to achieve the goals in ICT developments. Therefore, three waves of education development plan has been established for the achievement of the goals, which include the introduction of basic ICT (2013-2015), the introduction of innovation in ICT (2016-2020), and the maintenance of the innovative use of the whole systems (2021-2025).

The total number of schools in Malaysia as reported by EMIS (2014) is 10,154. Out of that, 2,394 are secondary schools while the remaining 7,760 are primary schools. Those schools locate 5,120,802 students, with 196,077 children in preschool, 2,704,046 children in primary schools, and another 2,220,679 in secondary schools. To ensure teaching and learning is smooth, a total of 419,820 teachers have been employed to teach in those schools, in which 238,073 are teaching in primary schools and 181,747 are teaching in secondary schools.

In Malaysia, there are two government management information systems. The systems assist the teaching and learning as well as the managerial aspects. One of the systems is referred as Electronic Government Human Resources Management Information System (EG-HRMIS/ HRMIS) (*Sistem Maklumat Pengurusan Sumber Manusia Kerajaan Elektronik), while the other* is Education Management Information System (EMIS/ SMPP) (*Sistem Maklumat Pengurusan Pendidikan).* The

HRMIS is managed by *Jabatan Perkhidmatan Awam* (JPA) and the EMIS is managed by the MOE (Nurhafizah Yaacob, 2009).

Besides those two systems, some schools are currently using *Sistem Maklumat Murid* (SMM) and *Aplikasi Pangkalan Data Murid* (APDM) for management purposes. Both SMM and APDM are Student Information Systems (SIS) that stored students' information for easy access, update, and delete. The SMM is an offline system while APDM works online. Among all systems, this study focuses on the implementation of theAPDM in five secondary schools in the Kubang Pasu District, namely Sekolah Menengah Kebangsaan (SMK) Bandar Baru Sintok, SMK Changlun, SMK Hosba, SMK Paya Kemunting, and SMK Seri Mahawangsa. From the five schools, 110 teachers involved in this study as respondents.

Information systems are normally developed to simplify complex works to support management (Saruvari, 2005; Bennet et al., 2002). As for the school, Saruvari (2005) and Pegler (1993) believe that such systems could satisfy the pitfalls, and make management tasks more efficient and effective besides being able to solve common problems. The systems are also able to provide integrated solutions for the schools management. However, Meng (2002) suggests that the information systems work more preciously when they are managed by the most appropriate person.

The educational information systems have also been used in higher learning institutions (Seyed Mohammadbagher, Suha Fouad, Mohaddece Sadat, and Sharif Omar, 2015) such as by Lim Kok Wing Univeristy of Creative Technology in

Malaysia. When studying the learning management system (LMS) in higher learning institutions, Seyed Mohammadbagher et al., (2015) and Goyal and Purohit (2011) discover a positive relationship between LMS and user satisfaction, which determines student's achievement. User satisfaction characteristics have also been found positively affecting perceived usefulness. Besides that, Liaw (2008) indicates that the roles of readiness, system quality, and information quality are very important to increase perceived usefulness.

User interface (UI) is another factor that determines user experience. This is evidenced by the study done by Sedtanun, Nagul, and Suphakant (2012) and Hana Sadat, Fatemeh Orooji, and Fattaneh Taghiyareh (2012). The former study point out that user experience is influenced by screen design, whilst the later discover that it is enhanced by the quality of learning. Similarly, Pramudianto, Pulman, Jahn, Avila, and Jarke (2014) agree with both findings.

UI is defined as a discipline that focusses on the metaphor and design in the digital landscape (Zan Azma Nasruddin & Husnayati Hussin, 2013). Metaphor is the core idioms in Graphical User Interface (GUI), which plays an important role in helping users to interact with computer systems. Zhu, Miao, and Song (2009) reveal that UI design provides a great opportunity for improving user experience because it connects users and computers.

Recently, Faninda Purnama Sari and Noraidah Sahari (2015) revised one of the eight principles of UI design by Shneiderman and Plaisant (2004) by performing heuristic

evaluation to determine whether or not their SIS follows the standard and design principles found in the literatures. The eight principles include (1) Strive for consistency, (2) Enable frequent users use shortcuts, (3) Offer informative feedback, (4) Design dialogues to yield closure, (5) Offer error prevention and simple error handling, (6) Permit easy reversal of actions, (7) Support internal locus of control and (8) Reduce short term memory load. As a result, Faninda Purnama Sari and Noraidah Sahari (2015) findings are similar to those of Zan Azma Nasruddin and Husnayati Hussin (2013), which proved that UI does determine user experience.

Technically, the UI is composed of four variables; Screen, Terminology, Learning, and System Capabilities (Haslina Mohd, 2009; Shneiderman, 2004; Diehl, & Norman, 1988). Harper and Norman (1993) recommend that Questionnaire for User Interaction Satisfaction (QUIS) can be represented as a well-designed usability testing tool to determine the computer interface with computer user's subjective satisfaction. Relatively, the QUIS consists of satisfaction measures comprising of users demographic, and measures of user satisfaction in several aspects of interface such as screen, terminology, learning and system capabilities factors. Lin, Choong and Salvendy (1997) support Norman & Shneiderman (1989) that there are 21 out of 27 items that were closely related to interface features in QUIS. Haslina Mohd (2009) proposes a Multiple Perspectives Technology Acceptance Model (MP-TAM) for Electronic Medical Records (EMR). The testbeds used for the study were Putrajaya and Selayang Hospitals, which covered three perspectives; Technical, Social, and Behavioral. The technical perspective consists of System Capabilities, Information Quality, and User Interface factors. The social perspective includes

Perceived Ease of Use and Perceived Usefulness, while the behavioral perspective contains User Satisfaction. In this study, the MP-TAM by Haslina Mohd (2009) is adapted, by focusing only on the User Interface factors (Screen, Terminology, Learning and System Capabilities) following the technical perspective as proposed by Shneiderman & Norman (1989). Other perspectives remain unchanged. Information Quality is omitted because this study only focuses on the User Interface factor. Originally, Haslina Mohd (2009) states that Technical Perspective has a significant relationship with Social Perspective, and that Social Perspective has a significant relationship to Behavioral Perspective.

The coherence of the interface (screen) has been famously studied in the field of GUI (Wangmi, 2015). For example,Gu,Wang, Zhai, Ma, and Lin (2015) reveal that the screen context of computer has been typically generated by textual graphics. Another study by Ahn, Song, Yang, and Choi (2015) a screen composition method is proposed specifically for mobile multi-display environment interactive systems. Earlier on, Feng (2008) and Zhang (2009) worked on terminologies for certain specific domains, because it is very significant for text organization, information extraction, machine translation, and text categorization. As for today, the works on user interface are more diverse due to the advancement of the technologies. Hence, Chwen Kuo and Syan Lin (2015) a learning community in online or virtual learning environment is established. Before this, Hana Sadat et al., (2012) has already ventured into mobile learning capabilities context awareness. It is then extended into system capabilities, which is important for an organization to manage, coordinate and deploy sources to generate value (Bezerra & Medeiros, 2013). The most recent

related work explores the relationship between healthcare quality performance with the synergy among (EMR) in hospitals (Yousra, Surendra & Cherie, 2016).

Once developed, technologies need to be adopted in appropriate domains. Adoption is usually determined by multiple factors such as the innovation ease-of-use and its relative advantage (Rogers, 1983). Technology adoption has been getting attention among researchers, especially in the IT communities (Muneer Abbad & Mohammad Fahd, 2011;Grandon & Pearson, 2004; Vailer et al., 2004). Technology adoption refers to the process of introducing a new technology in organizations (Bouwman et al., 2005). In the existing adoption models, various weaknesses have been discovered by Benbasat and Barki (2007) and Lawrence (2010). Therefore, various works have been carried out to improve the models. As an example, Osden Jokonya (2015) uses Technology Acceptance Model (TAM) by Davis (1986) to verify IT adoption in organizations. His findings show that ease of use and usefulness issues are among the main issues. Hence, Osden (2015) recommends that demographic characteristics should be considered when adopting new technologies.

Besides TAM, there are a few other models that are suitable for determining IT adoption (Muneer Abbad & Mohammad Fahd, 2011). Among others are theoretical extension of TAM or known as TAM2 (Venkatesh & Davis, 2000), MP-TAM by Haslina Mohd (2009) and Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003).

1.2 Problem Statement

Seyed Mohammadbagher (2015) points out that LMS is less satisfied by students because the system contains some bias aspects. In addition, a big percentage of lecturers also do not use their LMS. Besides the initiative by Seyed Mohammadbagher (2015), there are many more works focusing on satisfaction. As an example, Mohd Hanif, Mahmuda Khatun, and Mohiuddin Ahmad (2015) use image processing to convert conventional screen to touch screen. To increase user satisfaction, they upgrade the system with multi touch and gesture-based interaction style. Another study conducted by Wiem Lahbib, Ibrahim Bounhas, and Yahya Slimani (2015) looks into the impact of terminology on Arabic enrichment and extraction approach. In the study, the user satisfaction is increased through the use of corpus structure and text mining. Sirait and Derlina (2015) indicate that teaching techniques should be made efficient to increase learner's satisfaction. Relating to that, applying learning model satisfies better than applying direct instructional model. A solution in wireless networks using link scheduling under the physical SINR interference model with interference cancellation capabilities is proposed by Long Qu, Jiaming He, and Chadi Assi (2010).

TAM is also used to determine factors that affect a recommender system (Armentano, Abalde, Schiaffino, & Amandi, 2014). In another study that uses TAM (Huang, 2014), it is found that student's personal innovative has positive influence over system's perceived ease of use and that there is no significant effect on system's perceived usefulness.

On top of those deliberated in the previous paragraphs, Yen et al. (2016) study shows that the indigenous learners were very satisfied with their usage of e-learning system. Factors that affect the usage of e-learning system in terms of interface usability are identified by employing standard and design principles to support user satisfaction (Fanindia Purnama Sari & Noraidah Sahari, 2015).

Even though, Rabin (1992) has outlined that human factors, UI design, information science, visual design, and instructional design can help in ensuring online systems work effectively, the weaknesses have to be consistently studied because of the continuous advancement in technologies whereby the interaction design is becoming more complex and dynamic (Brummermann et al., 2011; Sottet, Vagner,& Garcia Frey, 2015). Therefore, Haslina Mohd (2009) and Al-Gahtani (1999) recommend that design features should be investigated in online systems because a clearly delineated specific design features that influence the Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) is not yet available.

Behavioral Intention towards LMS in public universities in Saudi Arabia is also studied using TAM (Alharbi & Drew, 2014) by taking into account the use of PU, PEOU, and Attitude toward Actual Usage. It is found that PU and PEOU are significant in determining the Actual Use. In fact, Surendran (2012) and the founder of TAM, Davis (1989) have earlier mentioned these relationships. Particularly, PU expresses users belief upon a system that it could enhance her or his job in carrying tasks, while PEOU expresses users belief that the system being used is easy. Hence, PU and PEOU always become the independent variables of User Satisfaction.

Regarding the empirical test for UI satisfaction, the Questionnaire for User Interface Interaction Satisfaction (QUIS) can be utilized (Sittig, Kuperman, and Fiskio, 1999; Chin, Diehl, & Norman, 1988). The questionnaire was developed using the psychological test construction method. In 1988, researchers at the Universities of Maryland (Human Computer Interaction Laboratory) modified the QUIS to make it more generic so that it can be is standardized for interactive computer systems (Johnson, 2004). The QUIS consists of 11 dimensions, in which four dimensions are used in this study; Screen (S), Terminology (T), Learning (L), and System Capabilities (C). Haslina Mohd (2009) and Thong et al. (2000) recommend that UI is part of QUIS, which is independent from PU and PEOU. Particularly, Thong et al. (2000) classify S, T, L, and C as composite variables of UI. Hence, further research on UI factors that influence the PU and PEOU of computer systems should identify specific UI design that may influence the adoption of the system.

UI is an interface between a computer and user, as the name implies. In any computer system, UI is constituted as the most vital part three simple goals of interface design; (1) to make working with computer easily, (2) productive and (3) enjoyable with (Galitz, 2007). In addition, UI design is classified as a part of Human Computer Interaction (HCI) field. The two main components of UI include input and output. Input refers to a user's desires in using computer or communicating based on his or her needs while output is how computer conveys the requirements and results of its computation to the user. The right UI design will produce a combination of well-designed input and output mechanism to meet the user's requirements, limitations and capabilities in the most effective way.

Similar to Galitz (2007), Marcus and Gould in year 2000 have already stated that a well-designed UI will improve the system capabilities and the appearance of the web, which will then help in exchanging the browsers between residents and customers. With regards to this, Wickens & Hollands (2000) examine the eight guidelines in gettinguser's attention; (1) high intensity in drawing intention, (2) marking, (3) size, (4) choice of fonts, (5) inverse video, (6) blinking, (7) color, and (8) audio. The display of data comprises of five levels, which include; (1) consistency of data display, (2) efficiency of users' information assimilation, (3) minimal memory loading by users, (4) compatibility of data display with entry and (5) flexibility of controlling data display by users (Smith & Mosier, 1986).

In her study on the implementation of "*Sistem Maklumat Pelajar (SMP)*" and "*Aplikasi Pangkalan Data Murid (APDM)*", Norin Farizah Mohd Nuin (2013) mentions that the use of ICT did not achieved the level of MOE's target in terms of quality or quantity as stated in the *Laporan Awal-Pelan Strategik Pembangunan Pendidikan Malaysia; 2012-2025*. The amount spent by MOE in providing ICT as an incentive educational program is about 6 billion. Every school is required to use ICT in order to make sure that the data are ready when the "*Jabatan Pendaftaran Negara*" (JPN), "*Pejabat Pelajaran Daerah*" (PPD) and MOE needs them (Norin Farizah Mohd Nuin, 2013; Rashid, 1987). Moreover, the validity of the data needs to be secured to avoid wrong decision making (Azmi, 2004). Effective data security and maintenance are made possible with the use of ICT (Norin Farizah Mohd Nuin, 2013; Murdick, 1977; Mohd Yusri Mahadi, 1996).Types of data to be stored in a database can be classified according to (1) schedule, (2) search, (3) form, (4) report,

(5) macro and (6) field (Norin Farizah Mohd Nuin, 2013; Norasiah Abdullah, Rosnah Ahmad Zain, Mazilah Abdullah, 2011). In addition, the presence of Database Management System (DBMS) that consists of five components; (1) software, (2) hardware, (3) data, (4) procedure and (5) people, helps to store APDM data systematically, efficiently and securely.

Realizing the issues related to APDM implementation, particularly on the User Interface, another strategic plan has been initiated known as *Pelan Strategik: Bidang HEM: 2016-2020* to resolve the problem of incomplete information. The plan lists two strategies; (1) conducting workshops three times a year and (2) monitoring and providing information to teachers relating to the incomplete APDM information. Hopefully, this can help the ministry to achieve the objective of constantly updating the APDM data until completion by the year 2020.

The problems of developing a Student Information Management System, as identified by Mohd Nihra Haruzan Mohamad Said and Intan Marini Suhaimin (2010), include lack of coding expertise, lack of time and the inability to conduct the user interface testing among focus groups and students. Nevertheless, the authors suggest that the user interface of the system is simple and easy to use whereby the built-in buttons self-understood and very consistent.

From the above descriptions, it can be concluded that the existing APDM has never been evaluated especially problems related to the user interface. By identifying such problems, it may help to increase user satisfaction of the APDM system. Based on the literatures, this study will analyze seven factors related to user satisfaction; User

satisfaction (US), Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Screen (S), Terminology (T), Learning (L), and Capabilities (C).

1.3 Research Questions

Based on the current scenario as described in the earlier parts of this chapter, this study is going to provide answers to the following questions:

1. What are the UI design factors that influence the adoption of Student Information System (SIS)?
2. What are the relationships between the UI design factors with Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and User Satisfaction (US)?

1.4 Research Objectives

This study aims to achieve the following objectives:

1. To identify the UI design factors that impactthe APDM adoption from the behavioral perspectives.
2. To identify the relationships among the factors of the APDM adoption from the behavioral perspectives.
3. To validate the UI design factors that influence the APDM adoption from the behavioral perspectives using statistical analysis technique.

1.5 Scope of the study

The study focuses on the adoption factors of the *Aplikasi Pangkalan Data Murid* (APDM). The top management of five secondary schools in Kubang Pasu together with selected class teachers, who have access to the APDM are involved in this study. The five secondary schools is considered sufficient because the nature of the implementation of APDM is homogeneous. Data are gathered using survey technique.

1.6 Significance of Study

This study contributes to the field of Information System (IS) through the statistical evidence on the adoption the APDM, especially for an acknowledgement by the MOE. Technically, the findings conveythe satisfaction of the class teachers and top management on the use of APDM. Besides contributing to the body of knowledge, this study also will benefit other parties such as schools, MOE, class teachers, and system developers. Besides that, this study also contributes to the educational domain because APDM is part of the SIS that constitutes the main artifact.

1.7 Research Framework

The descriptions of the research framework of this study in included in Table 1.1.

Table 1.1: Research Framework

Phase	Activities	Outcomes
Phase 1	Reviewing literatures on SIS • Definition • Characteristics • Types of SIS • Adoption models • Vendors • Benefits Reviewing literatures on Adoption theory • Definition • Factors • Implementation • Challenges	A list of factors affecting APDM (Objective 1 achieved)
Phase 2	Identifying the relationship between UI factors, Perceived Usefulness (PU), Perceived Ease of Use (PEOU) and User Satisfaction	Relationship between factors. (Objective 2 achieved)
Phase 3	Verifying and validating using statistical analysis technique(SPSS 20.0)	Validated SIS adoption factors. (Objective 3 achieved)

1.8 Theoretical Framework

The basis of this study is based on the Haslina Mohd (2009) Multiple Perspectives Technology Acceptance Model (MP-TAM) as depicted in Figure 1.1. The research model was used to study the relationship between three different perspectives (technical, behavioral and social perspectives). The social perspective consists of Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). PU is the model that acts as a faith in decision making or based on expectation theory as defined by Liao and Landry (2000). Meanwhile, PEOU determines a person's belief such as using a particular system would be free of efforts (Davis, 1989). As for the behavioral perspective, it consists of User Satisfaction (US), which refers to a user's feeling about how well a product after a certain range of usage over time in a specific activity and environment (Haslina Mohd, 2009).

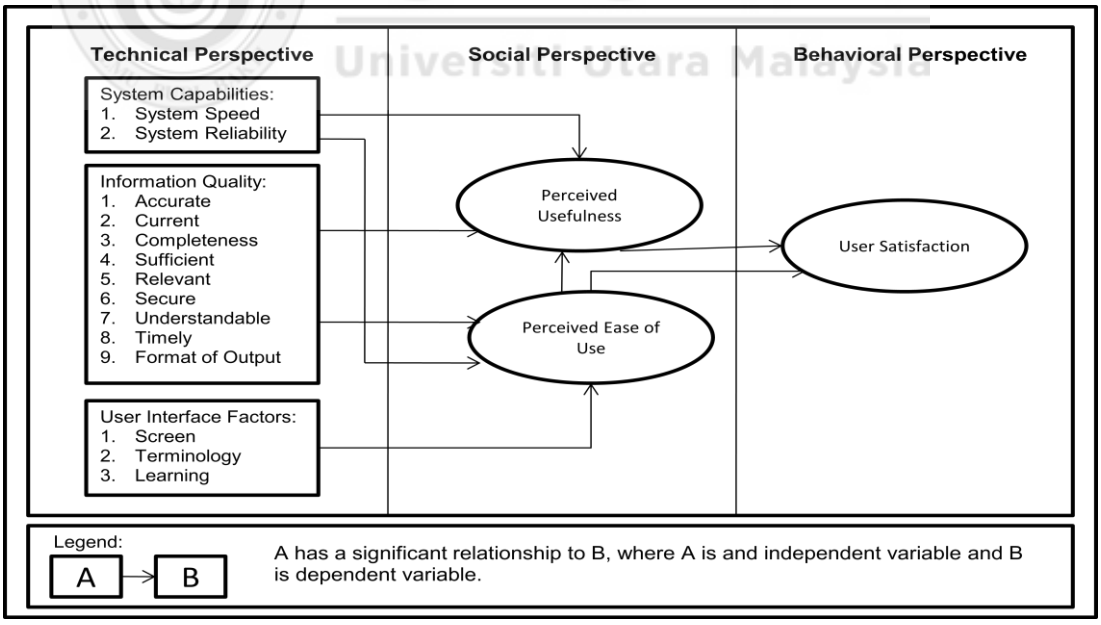

Figure 1.1 MP-TAM adapted by Haslina Mohd (2009)

Figure 1.2 illustrates the initial research framework of this study based on the MP-TAM model adapted from Haslina Mohd (2009). There are seven factors included in the framewok; (US), (PU), (PEOU), Screen (S), Terminology (T), Learning (L), and Capabilities (C). The three perspectives in the MP-TAM (Haslina Mohd, 2009) correspond to those suggested by Bailey and Pearson (1983) and Schneiderman (2004). In this study, the technical perspective consists of four variables of User Interface factors; Screen (S), Terminology (T), Learning (L), and Capabilities (C) (Haslina Mohd, 2009; Shneiderman,2004; Chin et al.,1988).

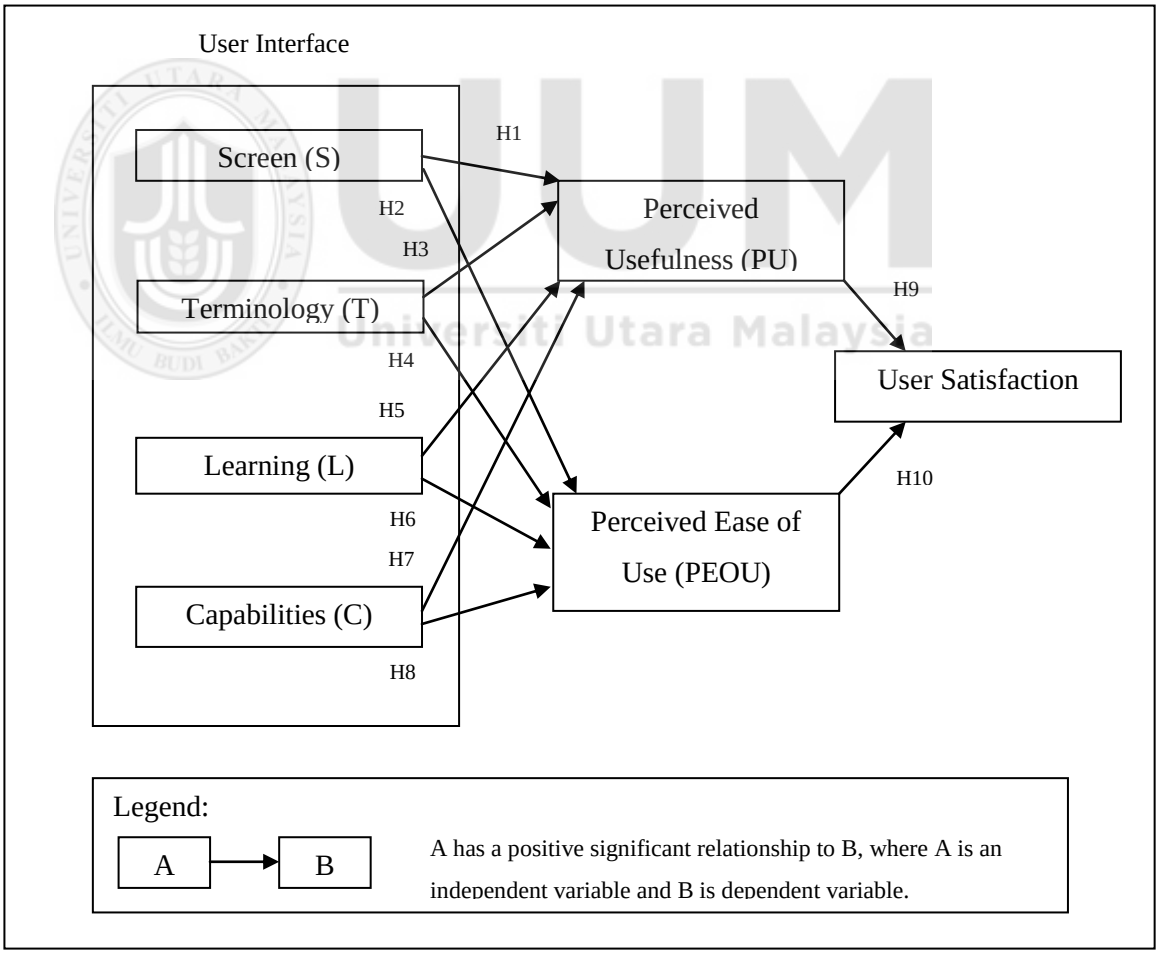

Figure 1.2: Theoretical framework of SIS adoption factors

1.9 Organization of the Study

This thesis consists of five chapters. The discussions in each chapter are briefed in the following paragraphs.

Chapter One: This chapter establishes the overview and motivation of this study. More importantly, it discusses about the problem to be solved, addresses the research questions and objectives, formulates the research hypotheses, clarifies the scope, justifies the significance of the study as well as outlines the research and theoretical frameworks. Generally, this chapter forms the background of this study.

Chapter Two: This chapter reviews the literatures related to this study. Among the discussions are those emphasizing on previous models on user satisfaction. The discussions of the various models are very important to support this study to enable the suitability of adapating them.

Chapter Three: Chapter three outlines the methodology used in this study. The chapter contains research procedure, research design, population and sample, pilot test, questionnaire design, data collection method, and data analysis techniques.

Chapter Four: Chapter four deliberates the data analysis including data screening, reliability test, factor analysis, correlation of the factors, one way ANOVA, and multiple regression analysis.

Chapter Five: Chapter five summarizes the whole study. The limitations and recommendations for future enhancement are also included.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter reviews the previous and existing works related to Student Information System (SIS) and factors of system adoption. The chapter begins by describing about information system (IS) and the various educational information systems followed by adoption factors and user interface. Finally the chapter ends with a summary.

2.2 Information System (IS)

DeLone and McLean (1992) have created a phenomenon after they published their concepts of Information System (IS) usage. In the meantime, the IS usage has been a central of IS research practice (Qin & Xiao, 2008; Venkatesh & Davish, 2000). In fact, Qin and Xiao (2008) and Burton-Jones and Straub (2006) discovered that IS concepts has been viewed in many ways across the domain of IS Success, IS Acceptance, IS Implementation, and IS in decision making.

IS is defined as a set of interconnected components such as hardware, software, people, and network that collects, retrieves, processes, stores and distributes information to support organizational decision making (Atieno, 2013; Petter et al., 2008; Alter, 1979; McLeod, 1990). IS was first introduced in mid 1960s when most business schools began to develop the Management Information System (MIS) for the purpose of managing organizational data. In 1970s, the upper level of management started to recognized the usefulness of IS not only in the business

management and operations but also throughout the entire organization. Then, in 1980s, manufacturing companies started to utilize the IS in their operations activities such as taking orders, managing distributions, and forecasting. Eventually, in 1990s, it was discovered that corporations are expecting for a supply chain system that enable their businesses to be more efficient and effective. As for now, the Internet is the backbone of the IS that enables to businesses to compete in global markets.

The existence of internet technology has enable the creation of online system such as e-commerce. Having such system, businesses are able to create, classify, store, use, disseminate, retrieve, preserve, and dispose records easily in online environment, as opposed to the traditional landscape. The online system also can reduce the problem of delays significantly (Gemmel & Pagano, 2003).Therefore, Marcial (2012) and Craig et al. (2013) recommended that organizations have to formulate strategies related to the use of ICT to support their business processes. Similar to other IS, the online system also has some limitations. Among them are poor record management and lack of integration between businesses (Mohd Idzwan Mohd Salleh et al., 2010).

In the context of educational information system, In school context, Demir (2006) studied about School Management Information System (SMIS) in primary schools, as an extention to the works by Christopher (2003) and Selwood(2000). They found that IT and communalities lead the role in the school activities.

2.3 Student Information System (SIS)

According to Sulaiman, Hasmat, Mat Yamin, and Mohd Noor (2008),Electronic Student Academic System (E-SAS), a computerized system that replaces the manual system, is one of the systems that facilitates the administrative and academic staffs in academic assessments and student profile management. Two types of assessment are included in the E-SAS such as final year test and mid-termtest. Users found that the E-SAS is capable of searching and displaying students' information. Furthermore, it can also produce and calculate the assessment reports for every test.

The Student Information Management System (SIMS), used by the Sekolah Menengah Kebangsaan Ayer Keroh, Melaka, aimed at assisting personnel in managing school activities (Yob, 2007). The usage of SIMS has somehow affected teaching folio because teachers, schools and administrators are bombarded with a large amount of information (Muhammad Musa Hayatu, 2011); Herman, 1988). Similar systems to the one used by the Sekolah Menengah Kebangsaan Ayer Keroh, Melaka were also developed by Rozana Mohd Amin (2010), Boutke, Rigby, and Burden (2000) and Meng (2002). These system were developed to provide the best quality of data.

On the other hand, Kannan and Bansal (2013) had different views of the SIS. For them, the system manages the administrative process in educational institutions including attendance, admissions, and housing. The LMS is viewed as an application for users, specifically the administrators, to access the data and information related to education management. It is very helpful for learning process and it can store

quizzes, assignments, projects, and exams, which are parts of the 15 school administrative and management aspects (Crawford, 1997) as illustrated in Figure 2.1.

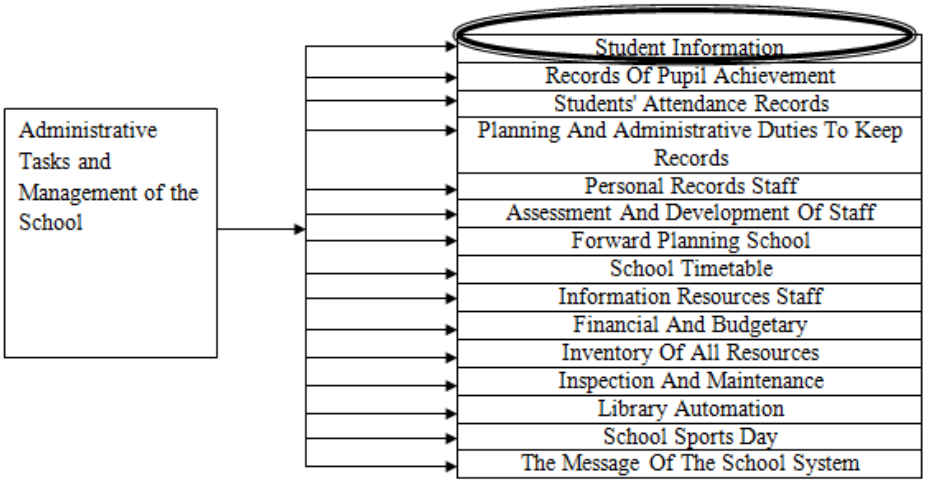

Figure 2.1: The aspects of the educational tasks

Besides the various benefits of SIS as discussed in the previous paragraphs, PriceWaterhouseCooper (2001) pointed out that the energy and time saved are also among the advantageous for students because the teachers will have a better plan, more time to guide them and prepare lessons.

Prior to the development of the systems discussed in the previous paragraphs, Manchandra and Mukherjee (2004) had studied and reviewed the success models of IS from studies between 1981 and 1987. They found a chronology in the IS evolution. First, Technology Acceptance Model (TAM) was developed by Davis (1989),which was based on the Theory of Reasoned Action (TRA). Then, they found 6 variables of IS Success model, which were underlined by DeLone and McLean (1992) with user satisfaction (US) as the dependent variable. Next, DeLone and McLean (2003) found that the process of combining and varying in the same model

is confusing. Gable et al. (2008) worked on the IS Impact model that measures the stream of benefits at a given point of time.

On the other hand, Habib Mat Som and Ahmad Kamaluddin Daud (2008) and Rahmad Sukor (2006) discovered that SMIS helps the school authorities to perform eleven related tasks. The first task related to the facilitation of the school administrators decision making. The second was the ability to improve the efficiency of the school management and administration. The third helped to reduce issues related to performing multi-tasking works. Increasing the efficiency of file management is handled by the fourth task, while the fifth task simplified and saved time in terms of collecting, processing, and storing data regarding student attendance reports. In the sixth task, the efficiency of preparing and handling grades and examination scores was increased, while the seventh task managed the placement of student in class, and the eighth task was on scheduling. The ninth task was to construct teachers' timetable and the tenth task was to handle material distribution such as textbooks. Finally, the eleventh controlled the inventory related issues.

2.4 School Management System

According to MOE Education Technology Division (MOE, 2013), the School Management System or better known as *"Sistem Pengurusan Sekolah"* (SPS) costs about RM18, 388, 400.00. The system integrates data in multiple information systems. With that, it provides more educational operations with a duplicate key in common data, using the architecture illustrated in Figure 2.2. Initially, it was intended to create a web-based SPS, which automates two main fields; the management of teaching and learning and administrative works. In the beginning, it

increased teachers' workload. The management information value was only realized after its integration stage (Madiha Shah, 2013).

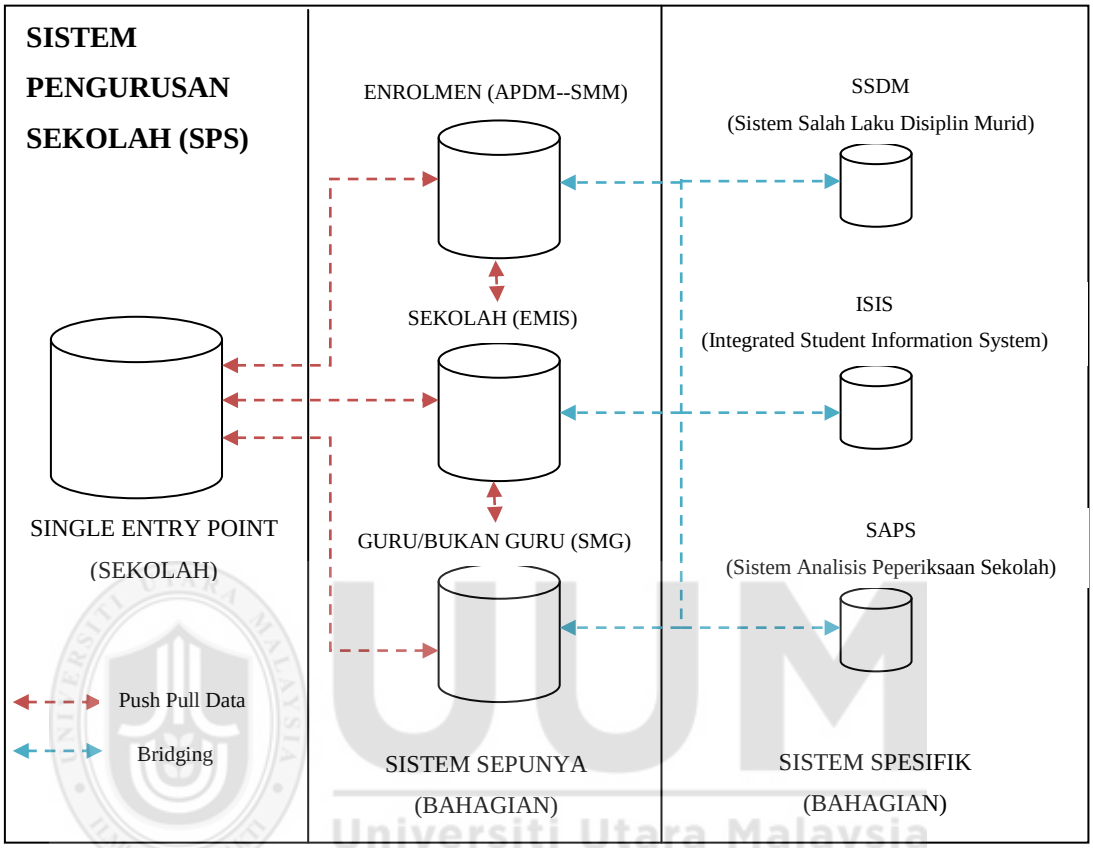

Figure 2.2: Data Integration Architecture

Referring to Figure 2.2, the legend contains Push Pull Data and Bridging, which refer to the Standard Operating Procedures (SOP) that map and link the related three databases;*"Aplikasi Pangkalan Data Murid"* (APDM) – online system or *"Sistem Maklumat Murid"* (SMM) – offline system,*"Sistem Maklumat Pengurusan Pendidikan* or Educational Management Information System(EMIS), and "*Sistem Maklumat Guru"* (SMG). Besides these three systems, others include *"Sistem Salah Laku Disiplin Murid"* (SSDM), "Integrated Student Information System" (ISIS), and *"Sistem Analisis Peperiksaan Sekolah"* (SAPS) that can also be integrated with the SPS.

Before the SPS was used, most schools were using the SMM to store student data. The system differs in each school. In terms of its operationalization, class teachers have to key in the data during school hour. This can cause data redundancy because other authorities cannot cope with the data center because of the difficulties to obtain the data.

SPS[1] aimed at increasing the service quality of the MOE. Hence, besides integrating a number of databases, it integrates also a few web services. The systems work seamlessly smooth on an interoperability platform using Extensible Markup Language (XML), as underlined by Mackiewicz (2006). When the integration works were accomplished, the other systems were terminated (Sufaat Tumin, 2014). Based on the SPS implementation guidelines, MOE (2014) stated that the web services facilitate teachers, students, and schools to only focus on the system. This was to prevent them from entering data repeatedly. The integrated system was found to contribute to the school community significantly, especially to the teaching and learning activities (Madiha Shah, 2013).

Apart from various functionalities, SPS was also designed as a dashboard application. SPS comprised of three modules; school management (*Pengurusan Sekolah* – (PS)), teacher management (*Pengurusan Guru*– (PG)); and student management (*Pengurusan Murid* – (PM)). PS contained registered information about educational institutions in Malaysia with a given code by *"Bahagian Perancangan dan Penyelidikan Dasar Pendidikan"* (BPPDP), MOE. Meanwhile, PG was used in

[1] https://sps1.moe.gov.my/

various levels of management for producing reports and statistics for teachers, and PM located all student information starting from preschool until form 6 or college or matriculation (MOE, 2014).

While the intention is huge, MOE (2014) stated that there were some discrepancies in maintaining the SPS. The first was to determine the roles of managers for managing the system and its data. Second was to select the person to verify and validate the data and information. Third was to decide on the authorized person to verify the report and statistical analysis. Fourth was to identify the person to ensure that the profiles of students, teachers, schools and staffsare updated. Fifth, the person to provide and generate the output for data regarding students, teachers, schools and staffs based on the current needs for all management levels. Last but not least, to ensure that the implementation was always updated, verified, and performed by *"Jabatan Pendidikan Negeri"* (JPN) and *"Pejabat Pelajaran Daerah"* (PPD).

The advantages of using the APDM included the ability to avoid data redundancy and facilitate the authorized parties in accessing information (Badru Dija Khan, 2005; Conolly & Begg, 2002). APDM can also detect the presence of a student based on the available data. Besides teaching, class teachers were also responsible in keeping the data and information safely. The class teachers were required to update the student information system from time to time to ensure validity and reliability.

A Smart School Management System (SSMS) was developed to support the learning and teaching functions as well as to facilitate the management of contents and resources (Muhammad Shahbani Abu Bakar, 2006; Majid Konting et al., 2003).

SSMS covers nine areas of school management. In addition, there was another known as *"Sistem Maklumat Pengurusan Pendidikan"* (SMPP) to support the data management at MOE (Muhammad Shahbani Abu Bakar, 2006; Azmi Zakaria, 1997). The SMPP had been installed in every school in Malaysia.

The implementation of the SPS satisfied many parties because every school was using the same system. As a web-based system, SPS could be accessed from anywhere. Having an integrated database, data input and access was more efficient, and the reports were standardized among various schools. SPS was also considered as a solution for reducing teachers'workload, whilst the integrated data can facilitate many parties and authorities in the education sector (MOE, 2013).

2.5 *Aplikasi Pangkalan Data Murid* (APDM)

"Aplikasi Pangkalan Data Murid" (APDM) was one of the SIS proposed by MOE in Malaysia. According to the Information Management Sector of the Johore Education Department (2013), there were four active modules of an APDM; student information *(Data pelajar),* primary school registration *(eDaftar Rendah),* secondary school registration *(eDaftar Menengah),* and student attendance *(eKehadiran).* The APDM comprised of seven levelsof access; Log in Johor's JPN, Log in Sector Management School, Data Entry Operator (DEO) Log in, Log in Schools, Log in Classes, Log in Governance School Assistant, and Log in Parents.

The users of the APDM application were the class teachers that had been registered by the respective schools administrators. As users, the class teachers were allowed to

perform a number of operations such as deleting, updating, and transferring students' data, as well as registering new students. The SIS would eventually provides useful information to the MOE, JPN, PPD, and schools.

The APDM (showcased in Appendix A) was composed of two main menus; *Aplikasi* and *Utiliti*. The *Aplikasi* menu consisted of five options; Change Password, Student Data, Class Registration, Application, and Assessment, whilst the *Utiliti* menu consisted only two options; Home page and Logout options. All of these options were stated in Bahasa Melayu and the most frequently used options were Student Data and Class Registration. The Student Data option had three functions; delete, update, and add new data. The Application and Class Registration were the two most important options in SIS that enable users to add new class, update and delete existing class.

2.6 Previous Studies on SIS

Information Management (IM) had become a trend in providing and monitoring the facts, ideas, and data of an organization's key members that were used in its operation (Muhammad Musa Hayatu, 2011). In IM, information is regarded as a resource that need to be managed similar to other resources such as human being, material and money. IM does not only cover the system but also the management of document, record, web content, and learning management system in term of technology (Robertson, 2005). In this regard, Madiha Shah (2013) studied the impact of Management Information System (MIS) in school administration. She added that educational management of information was used to expand more than

just efficiency and effectiveness. In her study, she discovered that in the earlier stage of development, the main usage and purpose of MIS was to increase the efficiency of school activities. In short, Madiha Shah (2013) agreed with Telem (1999) and O'Brien (1999) that the MIS should support the schools' objectives and aims.

Having determined the organizational goal, the strategies for achieving it have to be formulated. Attaran and VanLaar (2001) proposed the following steps related to the formulation of strategies: (1) set proper strategy, (2) learn technology, (3) commit possible resources, (4) involve in other processes, (5) plan a tactical training program, especially for staff/teacher, (6) develop plans to overcome organizational anxiety, (7) rely on specialists and (8) manage legal liability.

In a school environment, most teachers are not aware of distress. As a consequence, the teachers are exposed to health problems and work performance issues. In handling these issues, Azizi Yahaya, Jamaludin Ramli and Mazeni Ismail (2010), Zakiah Arshad (2003), and Gold and Roth (1993) proposed to change the education policy. For instance, the MOE could take several preventive steps such as conducting seminars, workshops, and courses. These kind of trainings were found to be effective in helping teachers to use computers for finding and accessing information to gain new knowledge (Mojgan Afshari et al., 2012).

After an extensive review on previous studies related to Perceived Usefulness and Perceived Ease of Use, another feature that can be considered as very important for the APDM is the Screen Sub-factor (Alharbi & Drew,2014; Haslina Mohd, 2009; Thong, Wong & Tam,2002).Screen was found to have significant relationship to

Perceived Usefulness and Perceived Ease of Use (Haslina Mohd, 2009; Thong et al., 2004, 2002; Rosenbaum& Crownover,1998).In addition, Haslina Mohd (2009) and Al-Gahtani (1999) recommended that the design features should be investigated in online systems because a very clear delineated specific design features that influence the (PU) and (PEOU) is still missing.

From this point of view, it can be concluded that Screen has significant effect on the APDM Perceived Ease of Use and Perceived Usefulness. (Hypothesis 1 and Hypothesis 2).

Besides Screen, another features that is very important for the APDM is the Terminology Sub-factor (Alharbi & Drew, 2014; Haslina Mohd, 2009; Thong, Wong & Tam,2002). This sub-factor has a significant relationship to Perceived Usefulness and Perceived Ease of Use (Tsakonas & Papatheodorou, 2007;Adams,Stubbs & Woods, 2005;Lee et al., 2005; Thong et al.,2004, 2002).The UI factors that can be considered as having high quality for interactive systems should consist of four variables Screen, Terminology, Learning and Capabilities (Shneiderman, 2004;Chin et al.,1988). The UI is also appropriate for other types of non-educational websites (Sauro,2015;Singh& Kumar, 2014; Aladwani & Palvia, 2002).

From this point of view, it can be concluded that Terminolgy has significant effect on the Perceived Ease of Use and Perceived Usefulness of APDM. (Hypothesis 3 and Hypothesis 4).

The Learning Sub-factor is also identified as another very important feature for the APDM (Sotoca, Catalani, Ghoneem & Ameer, 2016; Alharbi & Drew, 2014; Manouseis, Drachlers, Verbert & Santos, 2010; Haslina Mohd,2009; Shneiderman, 2004; Thong, Wong & Tam, 2002; Chin et al., 1988; Davis, 1989). Learning has significant relationship to Perceived Usefulness and Perceived Ease of Use (Liaw & Huang, 2012; Liaw,2007; Ong, Lai & Wang,2003; Crownover,1998).

From this point of view, it can be concluded that Learning has significant effect on the Perceived Ease of Use and Perceived Usefulness of APDM. (Hypothesis 5 and Hypothesis 6).

Another feature found to be very important for the APDM is System Capabilities Sub-factor (Alharbi &Drew,2014; Hernandez, Ramirez & Gonzalez,2012; Tidwell, 2011; Shneiderman, 2004; Chin et al., 1988; Davis,1989;. System Capabilities has significant relationship to Perceived Usefulness and Perceived Ease of Use (Ramayah & Chiun Lu, 2017; Shneiderman, 2004; Liau & Landry, 2000; Igbaria&Iivari,1995). The System Capabilities factor is critical because if does not perform well, teachers would be having the problem of high workload (Azizi Yahaya, Jamaludin Ramli & Mazeni Ismail,2010; Zakiah Arshad, 2003; Gold & Roth,1993).

From this point of view, it can be concluded that System Capabilities has significant effect on the Perceived Ease of Use and Perceived Usefulness of APDM. (Hypothesis 7 and Hypothesis 8).

Most of the factors that may contribute to the User Satisfaction are influenced by the User Interface of the APDM (Seyed Mohammadbagher, 2015; Alharbi & Drew, 2014; Haslina Mohd, 2009; DeLone & McLean, 2003; Liau & Landry, 2000; Al-Gahtani, 1999;Venkatesh & Davis,1996; DeLone & McLean,1992; Davis, 1989; Ginzberg,1981). Many related studies had pointed out that the Perceived Ease of Use is important for User Satisfaction of the APDM purpose (Wixom & Todd, 2005; DeLone & McLean, 1992; Alharbi &Drew, 2014; Haslina Mohd, 2009 & Al-Gahtani, 1999; Hernandez et al., 2009; Singh & Kumar, 2014, Khawaja & Bokhari, 2010; Weir et al., 2000). However, others studies have used this factor namely as "Usability" (Rizavi et al., 2011; Sauro,2015; Barnes & Vidgen, 2006).

From this point of view, it can be concluded that Perceived Usefulness has significant effect on the User Satisfaction of APDM. (Hypothesis 9).

After an extensive review on previous studies on User Satisfaction, we have concluded that there are a few factors that may contribute to User Satisfaction factor. Most of these factors influence by User Interface of the APDM. So many studies really agreed with the importance of Perceived Ease of Use for User Satisfaction of the APDM purpose (Wixom & Todd, 2005; DeLone & McLean ,1992; Alharbi & Drew,2014; Haslina Mohd, 2009 & Al-Gahtani,1999; Hernandez et al., 2009; Singh & Kumar, 2014, Khawaja & Bokhari, 2010; Weir et al., 2000). However, others studies have used this factor namely as "Usability" (Rizavi et al., 2011; Sauro,2015; Barnes & Vidgen, 2006).

From this point of view, we can conclude that Perceived Ease of Use has significant effect on the User Satisfaction of APDM. (Hypothesis 10)

2.7 The Adoption Factors

There are seven potential adoption factors to evaluate the SIS. These include User satisfaction (US), Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Screen (S), Terminology (T), Learning (L), and Capabilities (C) as adapted from Haslina Mohd (2009). The adoption factors can evaluate the intention to use and the use of real time system (Karuppiah, 2010).

2.7.1 User Satisfaction (US)

Chen, Huang, and Hou (2009) when repeated the study done by DeLone and McLean (1992) found that IS success model would be a higher readiness or willingness to persist to use the system and to enhance the user satisfaction that would affect individual and organizational performance. Furthermore, it could improve the effectiveness of the organization if the usersare satisfied with the information and system quality. Such relationship is illustrated in Figure 2.3.

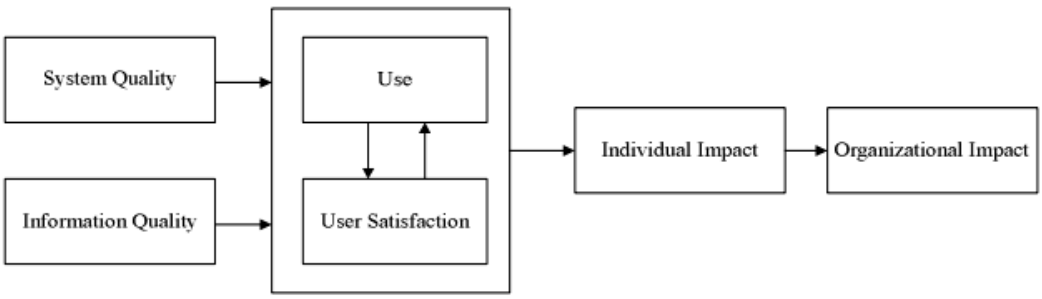

Figure 2.3: IS Success Model

Figure 2.3showcases that the model which is composed of five dimensions for assessing and measuring organizational performance. In this study, the User Satisfaction (US) dimension is selected to be a factor. According to Dai et al. (2011) based on the IS success model, the higher willingness of users to continuously use the system is obtained when they are satisfied with the information and system quality. Therefore, individual performance will be affected when user satisfaction is improved. Saruvari (2005) and Avison and Fitzgerald (1993) underlined that IS must aim at committing to relevant information, especially to be used in the right way, at the right time, in appropriate level, and accurate enough to present the information.

According to William, Weidong, and Torkzadeh (1994), DeLone and McLean (1992), and Ives and Olson (1984), User Satisfaction is the most important measures in examining the success of IS. It is also considered as an important theoretical issue of structure and dimensionality (Swanson, Larcher, & Lessig, 1982; Doll & Torkzadeh, 1988; Ives et al., 1983; Zmud, 1978). Besides, a few other researchers have also devoted a consciousness and took a serious attention about the User Satisfaction (e.g., Baroudi & Orlikowski, 1988; Goodhue, 1988;Bailey & Pearson, 1983; Jenkins & Ricketts, 1979).

After an extensive review on the previous studies on SIS, this study finds that there are factors contributing to the adoption of SIS. One of the factors is User Satisfaction (Au, Ngai & Cheng, 2008; Chen et al., 2006; Zviran, Guezer & Auni, 2005; Karimi, Somers & Gupta, 2004; Delone & McLean, 2003; Muylle, Moenaert & Despontin,

2003; Zviran & Erlich, 2003; Lee & Chin, 2000). User Satisfaction isalso a factor in term of Learning system (Liaw, 2008; Sun, Tsai, Finger, Chen, &Yen, 2006; Wang, 2003).

2.7.2 Perceived Usefulness (PU) and Perceived Ease of Use (PEOU)

Yun et al. (2011) repeateda theory that was introduced by an American scholar, Davis (1989), which is composed of five dimensions called Technology Acceptance Model (TAM),shown in Figure 2.4.

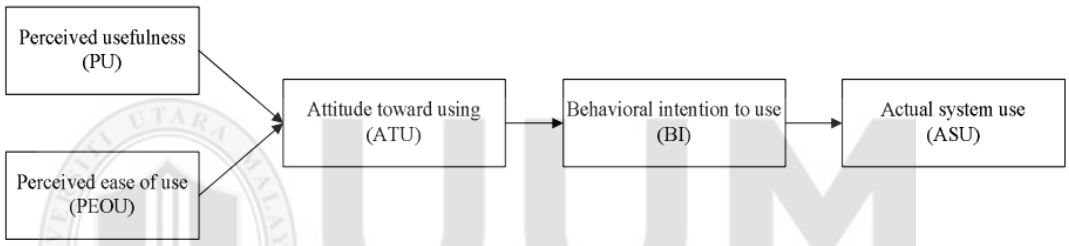

Figure 2.4: Technology Acceptance Model (TAM)

With reference to Figure 2.4, Davis (1989) formulated that (PU) and (PEOU) have a significant impact on user's acceptance upon technology. Accordingly, both PU and PEOU are chosen to be part of the factors in this study. Chin, Han, and Yi (2011) reviewed 24 studies on TAM and found that the model has been proven to be very useful in explaining the attitude and behavior of the users.

2.7.3 User Interface (UI)

Haslina Mohd and Sharifah Mastura (2005) and Shneiderman (2005) denoted that User Interface (UI) can be examined by QUIS, which only focuses on the technical part. Haslina Mohd and Sharifah Mastura (2005) and Slaughter, Norman and Sheinederman (1995) added that User Interface (UI) factors could be used for identifying the strength and weaknesses of a system. There are four factors making User Interface (UI); Screen (S), Terminology (T), Learning (L), and Capabilities (C), which are also adapted in this study.

According to Jang et al. (2012), interaction design is also needed when a screen displays high-quality images, which emphasizes on emotion and humane interaction beyond the mechanistic approach. According to Georgescu (2009), terminology is an important aspect in communication. Meanwhile, Zhu and Fang (2012) and McKay11 and Ellis (2014) adviced that team members of a project have to share what they have learned to maintain the friendship values.

2.8 Summary of the Chapter

This chapter focuses on the identification of the factors adapted in this study. Literatures were reviewed, including the existing models that support the various system in the school environments. Others include the theories on performance. Accordingly, in this study, factors in developing a successful system for managing activities in learning and teaching are derived from both systems in schools and models measuring performance.

Table 2.1 Factors and the relationships with APDM

Factors	Variables	"*Aplikasi Pangkalan Data Murid*" (APDM)	Comments
		Mean Values	
1.User Satisfaction (US)	1.Prototype is very useful (US01)	**3.363**	• Based on the respondents' feedback, prototype of the system are not really encouraging to be satisfied. MOE have to run the strategic plan (2016-2025)effectively. • On the other hand, most of the respondents agreed that APDM prototype is very useful in order to satisfy the user satisfaction.
	2.Satisfied with prototype system (US03)	3.327	
	3.Prototype has adequate power (US04)	**3.309**	
	4. Prototype system is simulating (US05)	3.345	
	5. Prototype system is flexible (US06)	3.354	
2.Perceived Usefulness (PU)	1.Accomplish task more quickly (PU01)	**3.445**	• This explains that the system is not able to improve users' performance to be more systematic. • Based on the respondents' feedback, most of the respondents supportedthat tasks can be accomplished more quickly by using the APDM because it is DBMS oriented.
	2. Enhances the quality of work (PU02)	3.390	
	3. Make job easier (PU03)	3.363	
	4. Increase productivity (PU05)	3.390	
	5. Improve job performance (PU06)	**3.336**	
3.Perceived Ease of Use (PEOU)	1. Clear and understandable (PEOU02)	**3.327**	• This implied that the system is not very clear and not well understood. • Based on the respondents' feedback, APDM is found to be easy to use but need time to becomeskillful.
	2. Easy to become skillful (PEOU03)	3.340	
	3. Easy to use (PEOU04)	**3.472**	

Table 2.2 Sub Factor and the relationships with APDM

Sub Factors	Variables	"Aplikasi Pangkalan Data Murid" (APDM)	Comments
		Mean Values	
1.Screen (S)	1.Screen layout very helpful (S01)	3.490	• This conveys that the on-screen information is not really adequate. • (S) is the major strength of APDM. It is part of the UI factors. The highest mean is obtained by 'sequences on previous screen are possible' (3.518) and 'the information on screen is logical' (3.509). • This explains that participants are clear about the screen design and the navigation. With that, it strongly contributes to the superiority of APDM. • Accordingly, it is understandable that the participants are positive about the factor.
	2.The information on screen are adequate (S02)	**3.390**	
	3.The information on screen is logical (S03)	3.509	
	4.Sequences on next screen are predictable (S05)	3.481	
	5.Sequences on previous screen are possible (S06)	**3.518**	
	6.The progression of work clearly marked (S07)	3.472	
2.Terminology (T)	1.Terminology is on screen precise (T06)	3.473	• Terminology explains that the error messages are not helpful enough for the users. • Based on that, it is deduced that all participants view the factor positively. • Based on the respondents' feedback,they classified that the occurrence of the Error messagespromptwhen using APDM is not really helpful for the user.
	2.Consistent message on screen (T07)	**3.482**	
	3.Prompt for input is clear (T09)	3.427	
	4.Controlling of feedback is easy (T13)	3.382	
	5.Length of delay is acceptable (T14)	3.318	
	6.Error messages prompt is helpful (T15)	**3.309**	
	7.Error messages always clarify problem (T16)	3.327	

	8.Phrasing of error messages is pleasant (T17)	3.372	
3.Learning (L)	1.Time to learn is fast (L03)	3.446	• This indicates that the number of steps is not efficient, more than expected • Based on the means, the factor has been viewed by participants positively.
	2.Task performed in straight forward manner (L04)	3.409	
	3.Number of steps is just right (L05)	**3.336**	
	4.Complete task is logical sequence (L06)	3.418	
	5.Feedback of completion is clear (L07)	**3.436**	
4.Capabilities (C)	1.Fast enough (C01)	**2.963**	• This conveys that the system is a little slow than expected. • Based on the means, when compared with other factors, Capabilities (C) is quite low in general, but is still moderate • In overall, the main issue of the factors is (C). However, it does not seriously affected because the mean values are not extremely different. It is because C has the lowest mean value among all, which are 'fast enough' (2.963) and 'response time is fast enough' (2.981). • They convey that participants perceive the APDM and its response time as not fast enough. Those factors are influenced by the access time somehow, in which during peak hours and heavy access, the connection slows down. This affects the capability of the system.
	2.Response time is fast enough (C02)	**2.981**	
	3.Rate displayed is fast enough (C03)	3.109	
	4.Reliable (C04)	3.290	
	5.System failure seldom occurred (C05)	3.090	
	6.System always warns about potential problem (C06)	3.109	

CHAPTER THREE
METHODOLOGY

3.1 Introduction

This chapter describes the processes that this study has gone through. All techniques and methods are ensured to be systematic, resulting in convincing results and discussion. Particularly, population and sampling, research procedure, research design, pilot test, questionnaire design, data collection technique, and data analysis are given attention to.

3.2 Methodology of the Study

This study gathers data from five secondary schools in Kubang Pasu, Kedah. Particularly, the top management and teachers, as the stakeholders of SIS in the schools answered the distributed questionnaire. On top of answering the questionnaire, they were also interviewed for additional qualitative elaboration. The data were analyzed using Linear Regression Technique in SPSS version 20.0.

The questionnaire technique is used based on some recommendations made by Vinothini Vasodavan (2011) and Kirakowski (1997) that questionnaire is more precise than interview because in questionnaire, the responses are gathered in a standardized way, making analyzing easier. Besides, the techniqueis cheap and relatively quick (FaridMuhammad, 2015; Sekaran&Bougie, 2013). On the other

hand, research design acts as a master plan, showing the systematic process of data collection and data analysis (NibrasMosawi, 2015; ZikMund, 2003).

3.3 Research Procedure

As exhibited in Figure 3.1, this study commenced by reviewing the literatures on Student Information System (SIS) and the adoption of IS. Based on the review, this study identified the adoption factors and the relationship among the factors. Then, a questionnaire was designed and developed. It was then distributed to a sample of participants, involving five secondary schools in Kubang Pasu, Kedah. The gathered data were used to analyze the adoption factors of SIS, which were the User Satisfaction (US), Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Screen (S), Terminology (T), Learning (L), and Capabilities (C). Eventually, the findings suggest that the user interface factors do influence the adoption of SIS in secondary schools.

Table 3.1: Research Procedure

	Activities	**Objective Achievement**
Phase 1	Literature Review	1.User Interface factors that may influence User Satisfaction of APDM: Screen Terminology Learning Capabilities
	Comparison Model of Adoption Model -TAM -IS Success Model -QUIS -MP-TAM	1.MP-TAM

Phase 2	-Construct adoption model of APDM -Formulate Hypothesis	1.Adapted from MP-TAM 2.User Interface Adoption Model of APDM
Phase 3	-Questionnaire Design -Identifying sampling -Pilot Study -Data collection -Data analysis using SPSS 20.0	1.Results of hypotheses testing 2.User satisfaction model generated from multiple regression analysis
Phase 4	Report Writing	1.Final Report

3.4 Research Design

Zikmund (1988) as cited in Sivalingam (2015) stated that after formulating, the research problem, the research design should be developed. In addition to that, Mahmud (2008) claimed that selecting reliable sources and knowledge is one of the strategies in answering the research questions in research design. In regards to that, this study emphasizes on the relationship among the variables. In order to gather primary data, the best technique to be applied is survey because it could easily reach a large number of respondents (Juwita Mohd, 2014).

3.5 Systematic Literature Review Methodology

Philips, Lee, Ghobadian, O'regan, and James (2015) found an appropriate way to conduct a systematic literature review. In their recommendation, based on the literatures, this study should synthesize the dispersed findings into an analytical framework. Hence, the relevant articles were classified into four types; theoretical,

conceptual, qualitative, and quantitative based on the definition of the article as outlined by Philips et al. (2015). Plilips et al. (2015) and Crossan and Apaydin (2010) classified the key element into two parts of comprehensive review, either descriptive or thematic analysis. Furthermore, it is to identify the most important factors to measure User Satisfaction.

(1) Descriptive Analysis

Based on Table 3.2, at the first stage of review, there were 760 articles found. Next, after doing inclusion and exclusion based on the applied criteria, the number of articles were reduced to 306. Further, after reviewing the abstract based on quality and relevance, 217 articles remained. Eventually, all duplications were cleared, leaving only 199 articles for further analysis.

Table 3.2: Adapted Table from Philips et al., (2015) and Crossan and Apaydin (2010) Number of Journal Articles selected at each stage of review

Selection Stage	**Key Search Term**					
	SIS	UI	PU	PEOU	US	TOTAL
Original search	123	240	147	131	119	760
Post-Abstract Analysis	55	103	68	54	26	306
Post – Full Article Analysis	47	88	39	25	18	217
Total with duplicates	217					
Total excluding duplicates	199					

Table 3.3 clearly listed that majority of the studies fall under the UI followed by SIS, PU, US and PEOU. Most of the articles are available in IEEE followed by Google scholar and ACM.

Table 3.3 : Breakdown of the field of study of selected articles

Field of Study	Resources			
	IEEE	ACM	Google Scholar	Total
SIS	42	0	5	47
UI	79	1	8	88
PU	17	10	12	39
PEOU	10	13	2	25
US	14	1	3	18
Total Articles	162	25	30	217

(2) Thematic Analysis

Referring to Table 3.4, out of the total number of 217 articles, 62 are empirical and 155 are theoretical and conceptual studies.

Table 3.4: Adapted Table from Philips et al., (2015) and Crossan and Apaydin (2010) Thematic Analysis of Articles Reviewed - key themes

Key Themes	Empirical Studies (no. of articles)	Thereotical/ Conceptual Studies	Total no. of articles
SIS	13	34	47
UI	18	70	88
PU	12	27	39
PEOU	14	11	25
US	5	13	18
TOTAl	62	155	217

3.6 Research Factors and Research Variables

The research factors and its variables that were adopted from Haslina Mohd (2009) are described in Table 3.5.

Table 3.5: Summary of Research Factors and Variables

Authors	Factors	Description of Variables
Sheneiderman (2004) and Chin et al. (1989)	User Satisfaction (US)	US is connected to user's feeling and considers the whole system's usage
Davis (1989)	Perceived Usefulness (PU)	PU refers to the user's faith that would manage their task as needed by using the system in more efficient way
	Perceived Ease of Use (PEOU)	PEOU is related to the user's trust in using the system effortlessly.
Sheneiderman (2004) and Chin et al. (1989)	User Interface (UI)	UI consists of Screen (S), Terminology (T), Learning (L), and System Capabilities (C). • S refers to system's screen design that includes: 1. Screen layout, 2. Information display, 3.

		Information arrangement, 4. Clear sequence of screens, 5. Predictable screen sequence, and 6. Task progression. • T and Information System refers to the terms used in the system, including: 1. Computer terminology, 2. System domain technology, 3. On-screen messages, 4. Instruction of command, 5. Feedback, and 6. Error messages • L refers to the capabilities of features in the system in supporting users to learn to use the system, including: 1. Learning to operate the system, 2. Time taken to learn the system, 3. Ability to remember commands, 4. Complexity of performing tasks, and 5. Feedback after performing

		the task. • C refers to the software and hardware of the system capabilities that included: 1. Speed, 2. Response time, 3. Display rate of information, 4. Reliability of the system, 5. System failure, and 6. System warning.

Based on the identified classifications in Table 3.5, the codes and descriptions of each factor as exhibited in Table 3.6 were determined. In the table, the variables for PU and PEOU were inherited from Haslina Mohd (2009) and Davis (1989). Furthermore, the variables for S, T, L and C and as well as the US factors were inherited from Haslina Mohd (2009) and Shneiderman (2004).

Table 3.6:Code and Factor Description for each factor

No.	Factors	Variables	
		Code	**Variables Description**
1	User Satisfaction (US)	US01	1.The APDM prototype is very useful
		US02	2.The APDM prototype system is easy to use
		US03	3.I am very satisfied with the APDM prototype system
		US04	4.The APDM prototype system has adequate processing power
		US05	5. The APDM prototype system is stimulated

		US06	6.The APDM prototype system is flexible
2	Perceived Usefulness (PU)	PU01	1. Using APDM enables me to accomplish tasks more quickly
		PU02	2. Using APDM enhances the quality of my work
		PU03	3. Using APDM makes it easier to do my work
		PU04	4. I find the APDM useful in my work
		PU05	5. Using APDM in my job would increase my productivity
		PU06	6. Using APDM would improve my job performance
3	Perceived Ease of Use (PEOU)	PEOU01	1. Learning to use APDM is easy
		PEOU02	2. I find it easy to use APDM to do what I want to do
		PEOU03	3. I find it is easy for me to become skillful in using APDM
		PEOU04	4. I find the APDM is easy to use
4	Screen (S)	S01	1. Screen layouts are always helpful
		S02	2. The amounts of information that can be displayed on the screen are adequate
		S03	3. The arrangement of information that can be displayed on the screen is logical
		S04	4.The arrangement of information that can be displayed on the screens is very clear
		S05	5.The next screen in a sequence are predictable
		S06	6.Going back to the previous screen is possible
		S07	7.The progression of work related task is clearly marked
5	Terminology (T)	T01	1. The used of terms throughout APDM is consistence
		T02	2.The work related terminology is consistent
		T03	3. Computer Terminology used in the system is consistent
		T04	4.Terminology always relates well to the work you are doing
		T05	5. Computer Terminology is used appropriately
		T06	6. Terminology which appear on screen is precise
		T07	7. Message which appear on the screen is consistent
		T08	8. Position of instructions in the screen is consistent

		T09	9. Prompt for input is clear
		T10	10. Instruction for commands or functions is clear
		T11	11. Instruction for correcting errors is clear
		T12	12. Computer always keeps you informed about what it is doing
		T13	13. Controlling amount of feedback is easy
		T14	14. Length of delay between operations is acceptable
		T15	15. Error messages prompt out on the screen is helpful
		T16	16. Error Messages are always clarifying problem
		T17	17. Phrasing of error messages is pleasant
6	Learning (L)	L01	1. Learning to operate in the APDM is easy
		L02	2.Getting started the APDM is easy
		L03	3. Time to learn to use the system is fast
		L04	4. Tasks can always be performed in a straight forward manner
		L05	5. Number of steps per task is not too many or just right
		L06	6. Steps to complete a task always follow a logical sequence
		L07	7. Feedback on the completion of sequence of steps is clear
7	Capabilities (C)	C01	1. APDM speed is fast enough
		C02	2. Response time formost operations is fast enough
		C03	3. Rate of information displayed is fast enough
		C04	4. The APDM is always reliable
		C05	5. System failure seldom occurred
		C06	6. The system always warns you about potential problem

Based on Table 3.6, this study is interested in studying the different relationships of the four variables of UI as classified by Sheneiderman (2004) and Chin et al. (1989). Next, the relationships between Perceived Usefulness (PU): Screen, Terminology, Learning, and Capabilities and PEOU: Screen, Terminology, Learning, and Capabilities are decided. In the first place, if the UI variables are significant when

tested as a single variable with PU and PEOU, then the variables are valid and accepted as a part of UI variables. In contrast, if not, the variable must be excluded from the UI factors because the aim is to validate either the relationship among the UI variables are significant or not before the variables are used.

3.7 Research Model

Figure 3.1 shows the research model that contains the illustrative relationships between US with PU and PEOU, PU and PEOU with S, T, L, and C.

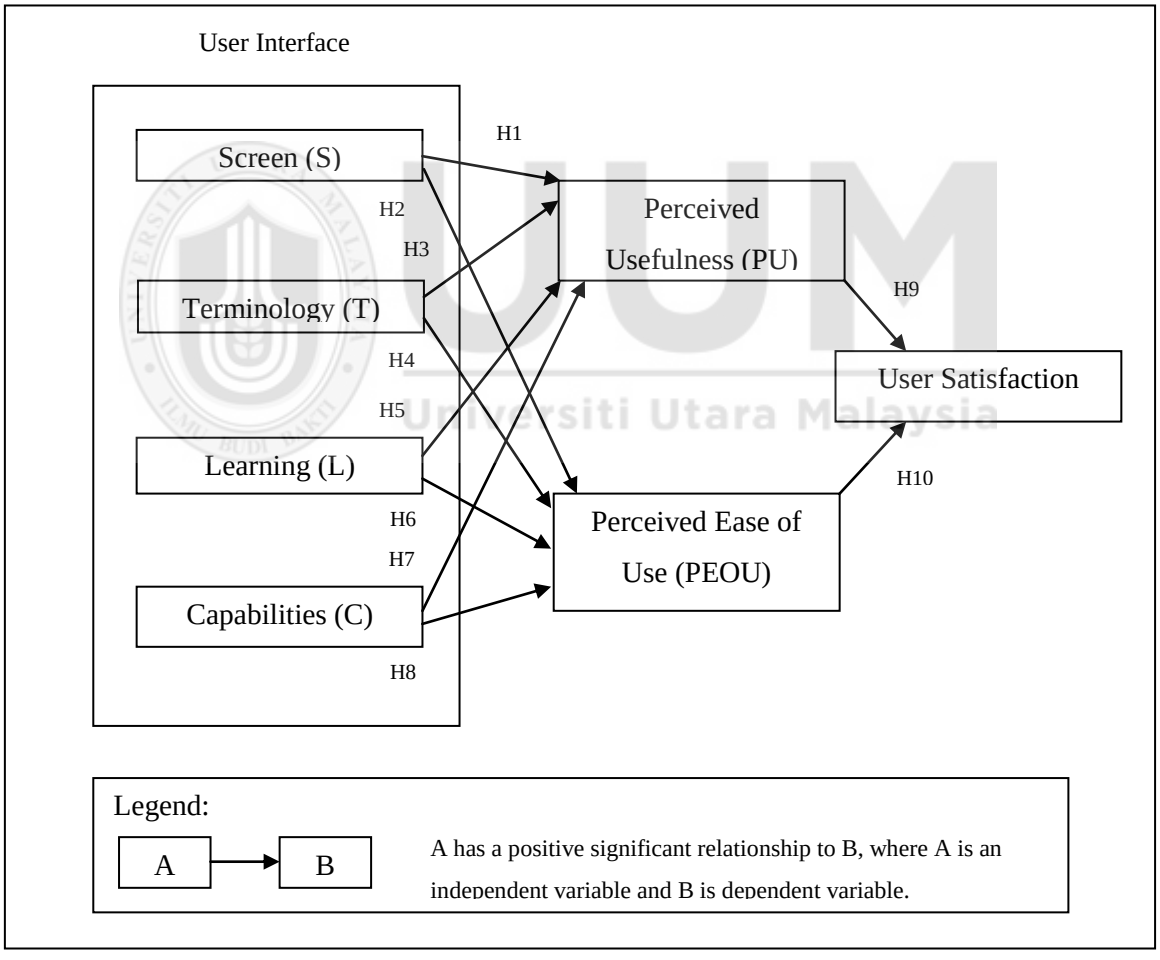

Figure 3.1: Initial research model of A Multiple Perspectives Acceptance Model adopted from Haslina Mohd (2009)

As shown in Figure 3.1, there are 10 relationships in the model. The model is adopted from A Multiple Perspective Technology Acceptance Model (MP-TAM) by Haslina Mohd (2009). Literatures on user acceptance factors (Haslina Mohd, 2009; Premkumar & Bhattacherjee, 2006; Wixom & Todd, 2005; Andrew, 2003;Tsiknakis, 2002; Yeo & Aurum, 2002; Bhattacherjee, 2001;Murff & Kannry, 2001;Liao & Landry, 2000; Zhang et al., 1999; Patel & Kushniruk, 1998; Venkatesh & Davis, 1996;Szajna, 1994;Davis, 1989) show that the acceptance of Information Technology usage is influenced by three perspectives; technical, behavioral, and social. For the purpose of this study, the three perspectives are considered, deriving from Haslina Mohd (2009).

The research model is used to measure the relationships among the factors as well as the variables and also to test the hypotheses. If the relationships among factors are significantly positive and the hypotheses obtain positive results, then the relationships are valid (opined by Miles and Shevlin (2002)). The research model is required to show the independent and dependent relationships of variables. In the model, the arrows indicate the flow from independent to the dependent variables. Meanwhile, the relationships of variables are labeled with numbers 1 to 10 that convey the hypotheses.

Briefly, the research model of this study is composed of 10 hypotheses in one construct. Screen (S), Terminology (T), Learning (L), and Capabilities (C) factors are the independent variables of Perceived Ease of Use (PEOU) and Perceived Usefulness (PU), in which the PEOU and PU are the independent variables of User

Satisfaction (US) factor. This study is looking for the User Satisfaction of Student Information System.

3.8 Research Hypotheses

Table 3.7 shows the relationship of independent and dependent variables exhibited in the research model. The relationships are then elaborated in the following paragraphs.

Table 3.7: Research propositions with independent and dependent variables

No.	Propositions	Independent Variables	Dependent Variables
1	(S) Screen has a relationship with Perceived Usefulness (PU)	S	PU
2	(S) Screen has a relationship with Perceived Ease of Use (PEOU)	S	PEOU
3	(T) Terminology has a relationship with Perceived Usefulness (PU)	T	PU
4	(T) Terminology has a relationship with Perceived Ease of Use (PEOU)	T	PEOU
5	(L) Learning has a relationship with Perceived Usefulness (PU)	L	PU
6	(L) Learning has a relationship	L	PEOU

	with Perceived Ease of Use (PEOU)		
7	(C) System Capabilities has a relationship with Perceived Usefulness (PU)	C	PU
8	(C) System Capabilities has a relationship with Perceived Ease of Use (PEOU)	C	PEOU
9	(PU) Perceived Usefulness has a relationship with User Satisfaction (US)	PU	US
10	(PEOU) Perceived Ease of Use has a relationship with User Satisfaction (US)	PEOU	US

The following hypotheses are further formulated:

H_1: Screen has a relationship with Perceived Usefulness.

H_2: Screen has a relationship with Perceived Ease of Use.

H_3: Terminology has a relationship with Perceived Usefulness.

H_4: Terminology has a relationship with Perceived Ease of Use.

H_5: Learning has a relationship with Perceived Usefulness.

H_6: Learning has a relationship with Perceived Ease of Use.

H_7: System Capabilities have a relationship with Perceived Usefulness.

H_8: System Capabilities have a relationship with Perceived Ease of Use.

H_9: Perceived Usefulness has a relationship with User Satisfaction.

H_{10}: Perceived Ease of Use has a relationship with User Satisfaction.

3.9 Data Collection and Analysis

Data were collected after revising the questionnaire, which was adapted from (Haslina Mohd, 2009; Shneiderman, 2004; Davis, 1989; Bailey & Pearson, 1983). The questionnaires was distributed to five secondary schools in Kubang Pasu. On top of that, a series of interviews were also conducted to gather additional and richer data from class teachers and the top management of the schools, who are the direct users of SIS. Having analyzed the gathered data, the results from both the questionnaire and interview were found to complement each other. The results also clearly identify the factors that affect the adoption of SIS in secondary schools (objective 2). Finally, the relationships between factors were determined using the Linear Regression Technique (Objective 3).

3.9.1 Instrument Design

Questionnaire was the main instrument used in this study for collecting data. The data collection was conducted from 3rd of November 2014 to 6th of November 2014. Before the questionnaires were distributed to the participants, this study managed to obtain permissions from the Ministry of Education Malaysia (MOE), *Jabatan Pendidikan Negeri* (JPN), and *Pejabat Pelajaran Daerah* (PPD), as included in Appendix B.

3.9.2 Questionnaire Design

The design of the questionnaire was constructed by taking into account the variables identified in the previous stage. Overall, there were 64 items including demographic profile. Specifically, the instrument contained 11 items for demographic characteristics, 6 items for measuring the User Satisfaction (US), 4 items for measuring Perceived Ease of Use (PEOU), 6 items for measuring Perceived Usefulness (PU), 7 items for measuring Screen (S), Terminology (T) and Learning (L), respectively, and 6 items for measuring Capabilities (C). The questionnaire was classified into three sections; Part A was about the demographic data of respondent, part B was about the variables or factors of the study, and part C gathered comments from the respondents. The measurement was based on the 5-point Likert scale, which was adapted from Gliem and Gliem (2013)as illustrated in Figure 3.2.

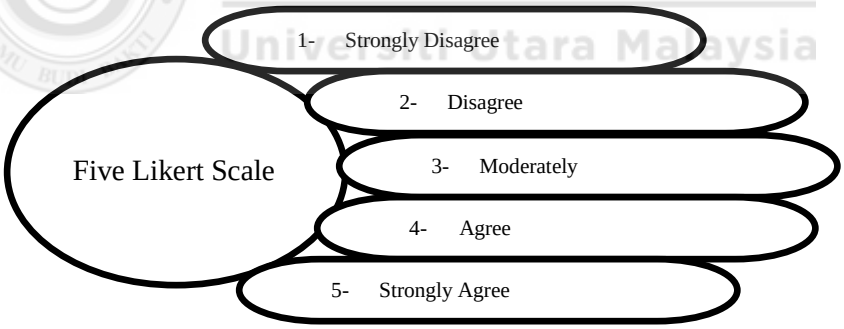

Figure 3.2 Questionnaire design based on the Five Point Likert Scale

3.9.3 Discussion with ICT Teacher and Top Management

Besides obtaining data from the questionnaire, interview session was also carried out involving both the ICT teachers and top management of the participating schools. The interviews were carried out in just a short period of time. The session did not distort any of the research process since it was carried out while waiting for all data to be analyzed and findings to be obtained. The interviewees explained about the APDM and SMM as well as the workloads management.

3.9.4 Sampling on Survey

This study involved five secondary schools in Kubang Pasu for data collection. The participated respondents were the class teachers and top management of the schools.

3.9.5 Population and Sample

Population indicates any elements, units, or individuals that meet the selected criteria for a group to be studied. From the total population, a part of representative sample is taken out for detailed examination (Siti Farah Syazana, 2015). The group of representative should share similar characteristics in certain particular context, which is within the interest of a study. Siti Farah Syazana (2015) also stated that sampling is the process that is used in statistical analysis and a number of observations would be taken out from a larger population. On the other hand, Zikmund (2003) explained that sampling allows for making a conclusion about the overall population.

For this study, the population was the five secondary schools in Kubang Pasu, which are SMK Bandar Baru Sintok, SMK Changlun, SMK Hosba, SMK Seri Mahawangsa, and SMK Paya Kemunting.Altogether, 150 questionnaires were distributed to the sample. The feedback were then gathered, in which14.5% were from SMK Bandar Baru Sintok, 30.9 % from SMK Changlun, 18.2% from SMK Hosba, 30.9% from SMK Seri Mahawangsa, and 5.5% from SMK Paya Kemunting.

3.9.6 Pilot Study

Pilot test is required to ensure the questionnaire is ready to be used for data collection (Vasodavan, 2011; John, 2008; Sekaran, 2000). This is important to ensure that the respondents could understand the items in the questionnaire and could answer the questions completely based on the given estimated time. Another aim for piloting the questionnaire is to make sure that the questionnaire meets the goals and is understandable by the respondents, otherwise the result may appear differently (Hasna Lumpingan, 2015). By doing this, unsatisfactory items (Sekaran, 2003) can be removed, or questions can be amended or adjusted (Hasna Lumpingan, 2015; Lucky, 2011; McIntire& Miller, 2007).

In this study, 40 questionnaires were distributed to the real users of the system in SMK Changlun. However, only 34 responses were received. This number of reponses is sufficient because a pilot study could work perfectly with 30 datasets (Naidu, 2014). Reliability test was also performed on the dataset to determine the reliability of the questionnaire (Lucky, 2011) .Regarding the reliability test, Tuckman (1999) outlines that 0.50 could already be significant. However, Hair,

Money, Samouel, and Page (2009) and Sekaran (2006) underline that 0.7 is good. The results of the Cronbach's Alpha for this study is shown in Table 3.8 and Table 3.9.

Table 3.8: Case Processing Summary

Case Processing Summary

		N	%
Cases	Valid	34	100.0
	Excluded[a]	0	.0
	Total	34	100.0

a. Listwise deletion based on all variables in the procedure.

Table 3.9: Reliability Statistics

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.976	.976	38

Based on Tables 3.8 and 3.9, the Cronbach Alpha value is 0.976. Thus, it can be concluded that the instrument is reliable. Therefore there was no omission or addition or modification effort needed. This enables the questionnaire to collect real data.

3.10 Data Analysis Techniques

The gathered data were analyzed to determine the relationship of each variable or among the variables (Mohd Izwan, 2015; Neuman, 2010). For that purpose, the data were analyzed using the Social Package for Social Science (SPSS) version 20.0.

3.10.1 Descriptive Statistics

Adibah Abdul Bari (2015) and Malin and Birch (1997) found that most studies compile and interpret raw data through data screening and descriptive statistics. Data screening is the process of checking data for errors, which is followed with certain actions to correct the error. In this study, it involved checking raw data, identifying outliers, inspecting missing data, and running normality test. Normality test is one of the inferential analysis prerequisites that ensures the gathered data are approximately or normality distributed classified (Adibah Abdul Bari, 2015; Halt, Babin, Anderson, & Tatham, 2007). Regarding that, Pallant (2013) suggested that Kurtosis shows the "peakness" of the distribution while Skewness shows the symmetricity of the distribution. On the hand, descriptive analysis deals with frequency, mean, and standard deviation. The analysis could explain various findings based on the gathered data. This study used the classification adapted from Mohd Izwan (2015) and Zikmun, Babin, Carr, and Griffin (2010), which is outlined in Table 3.10.

Table 3.10: Mean classification

No.	Level	Mean
1	Low	1.00 to 2.33
2	Moderate	2.34 to 3.67
3	High	3.68 to 5.00

3.10.2 Reliability Analysis

Reliability is a test measured through Cronbach's Alpha Coefficient. If the Cronbach Alpha value is 0.7 and greater, the data is concluded as reliable. There is a rule of thumb regarding this as outlined inTable 3.11(Hair, Money, Samouel, & Page, 2009; Sekaran, 2006).

Table 3.11: Coefficient of Cronbach's Alpha

Value	Level of Reliability
<0.6	Weak
0.6 to <0.7	Moderate/Received
0.7 to <0.8	Good
0.8 to < 0.9	Very Good
> 0.9	Strong

3.10.3 Factor Analysis

Factor analysis is the measurement for checking the validity of variables. Kaiser-Meyer Olkin or better known as KMO is used to measure the sampling adequacy (Subramaniam, 2015).

3.10.4 Pearson Correlation

Correlation is used to measure the relationship of two or more variables either in negative or positive directions (Sekaran, 2003). Hence, this study tested it on the stated hypotheses. David (1971) classified the scales used in interpreting the relationships among the variables as exhibited in Table 3.12.

Table 3.12: The Scales of Pearson Correlation Matrix

Scales	Relationship
0.80 above	Very Strong
0.50 to 0.79	Strong
0.30 to 0.49	Moderate
0.10 to 0.29	Low
0.01 to 0.09	Very Low

3.10.5 Multiple Regression

Gleaner and Morgan (2009) expressed that multiple regression analysis is extremely used in statistical data analysis that involved the dependent and independent variables. Further, Afidatul Asma Hassan (2015) described bi-variety correlation known as multiple regressions.

3.11 Summary of the Chapter

This chapter describes the methodology comprehensively. The whole process is described starting with identifying the solved problem until the analysis.Based on the descriptions on the previous chapters, all techniques are supported with a strong background.

CHAPTER FOUR
RESULTS

4.1 Introduction

The purpose of this study is to identify the factors that influence the adoption of student information system (SIS) in the state of Kedah. In conjunction to that, this chapter discusses the techniques for analyzing data, which were successfully gathered in three days through questionnaire distribution. The analyzing tasks involved normality and reliability tests, factor analysis, correlation, and descriptive statistics. The hypotheses were tested using the analysis of variance (ANOVA) and multiple regression. The results of all tests that were performed are also been detailed out in the subsequent sections.

4.2 Profile of Respondents

Demographic data convey descriptive information about people in terms of age, gender, and socioeconomic features (Vasodavan, 2011; Bernhardt, 1988). In this study, data were gathered from 110 class teachers in secondary schools in the Kubang Pasu District.Having analyzed the data, the results are detailed out in Table 4.1.The respondents are representatives from SMK Bandar Baru Sintok, SMK Changlun, SMK Hosba, SMK Seri Mahawangsa and SMK Paya Kemunting.

Table 4.1: Respondent's demographics information

Variables		**Frequency**	**Percentage**
School Name			
Valid	SMK Bandar Baru Sintok (SBBS)	16	14.5
	SMK Changlun (SC)	34	**30.9**
	SMK Hosba (SH)	20	18.2
	SMK Seri Mahawangsa (SSM)	34	**30.9**
	SMK Paya Kemunting (SPK)	6	5.5
	Total	110	100.0
Missing	System	0	0
Total		110	100.0
Type of School			
Valid	1 – Rural School	103	**93.6**
	2 – Urban School	1	.9
	Total	104	94.5
Missing	System	6	5.5
Total		110	100.0
Gender			
Valid	1 – Male	23	20.9
	2 – Female	79	**71.8**
	Total	102	92.7
Missing	System	8	7.3
Total		110	100.0
Age			
	1 – 21 to 30 years old	5	4.5
	2 – 31 to 40 years old	37	33.6

Valid	3 – 41 to 50 years old	52	**47.3**
	4 – 51 to 60 years old above	16	14.5
	Total	110	100.0
Missing	System	0	0
Total		110	100.0
Race			
Valid	1 – Malay	108	**98.2**
	2 – Chinese	1	.9
	3 – Indian	0	0
	4 – Others	1	.9
	Total	110	100.0
Missing	System	0	0
Total		110	100.0
Marital Status			
Valid	1 – Single	4	3.6
	2 – Married	103	**93.6**
	3 – Others	3	2.7
	Total	110	100.0
Missing	System	0	0
Total		110	100.0
Class Teacher			
Valid	1 – Form 1	13	11.8
	2 – Form 2	18	**16.4**
	3 – Form 3	18	**16.4**
	4 – Form 4	10	9.1
	5 – Form 5	14	12.7
	6 – Form 6	8	7.3
	Total	81	73.6

Missing	System	29	26.4
Total		110	100.0
Experience of using APDM *(Aplikasi Pangkalan Data Murid)*			
Valid	1 – < 1 year	8	7.3
	2 – 1 to 2 years	31	28.2
	3 – 3 to 4 years	37	**33.6**
	4 – 5 to 6 years above	12	10.9
	Total	88	80.0
Missing	System	22	20.0
Total		110	100.0

Table 4.1 exhibits that most respondents are from SMK Changlun and SMK Seri Mahawangsa (30.9%), Females (71.8%) are more than males. This is not surprising because it is common nowadays that female is always more than male. Most of them are(47.3%)between 41 and 50 years old, with majority of them are married (93.6%) Malays (98.2%). The distribution among different forms is quite diverse but majority of them are class teachers of forms 2 and 3 (16.4% each). Most of them have been using *Aplikasi Pangkalan Data Murid*(APDM) within 3 to 4 years (33.6%).

4.3 Data Screening

Coakes (2013) recommendsto run data screeningto ensure that the data are correctly entered and free from error. If data are not normally distributed, they have to be transformed before further analysis (Sukhri, 2015). It is very important to ensure that the results are reliable.Three steps in data screening include (1) check the data set for any occurrence of error, (2) find out whether the errors occur in the data file, and (3) correct the error in the data file (Pallant, 2005). Outlier (out of range) values can be determined by using descriptive or frequency commands(Coakes, 2013).

4.3.1 Normality Test

In general, the inference of normality is essential for many statistical techniques. There are a few ways to test the assumption using graphical methods such as stem-and-leaf plot, histogram, normal probability plot, and boxplot. There are also a number of non-graphical methods to test normality such as skewness, kurtosis and Kolmogorov-Smirnov (Paul, 2014). Normality test could also explore the characteristics ofvariable (Haslina Mohd, 2009) and it is a prequisite for most of the inferential techniques (Lumpingan, 2015; Nor Faezah, 2014; Coakes & Steed, 2007). In addition, Mosawi (2015), Pallant (2005), and Kline (1998) observe the skewness and kurtosis value of independent and dependent variables to determine the normal distribution of scores. There are various acceptable ranges when conducting skewness test. While Mosawi (2015) and Hair et al. (2006) believe in +1 to -1 range, Muhammad Firos (2014) uses +1.96 to -1.96. A positive skewness value denotes a

positive skew (Nor Faezah, 2014; Coakes & Steed, 2007). This study applies the most common one, which is between +1 and -1.

The factors considered in this study are User Satisfaction (US), Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), while the sub factors are Screen (S), Terminology (T), Learning (L) and Capabilities (C). The normality test has been carried out for all factors. The detailed results are available in Appendix D. It is observed that most variables are in the range of +1 and -1. However, there is a few sub factors which are not within the range as exhibited inTable 4.2. As a result, the variables are rejected and are not used for further analysis, leaving another 38 variables. For this study, it is sufficient to support the achievement of the objectives.

Table 4.2: Sub factors that do not fall into the normal range (+1 to -1)

No.	Variables	Skewness	Kurtosis
1	PU04	-1.135	
2	PE01	-1.226	1.845
3	US02	-1.050	
4	S04	-1.118	-1.839
5	T01	1.062	1.069
6	T02		1.244
7	T03		1.348
8	T04	-1.009	1.739
9	T05	-1.146	1.708
10	T08		-1.251

11	T10		-1.794
12	T11	-1.050	1.607
13	T12	-1.024	1.390
14	L01	-1.118	
15	L02	-1.067	1.067

4.4 Reliability Test

According to Sekaran (2003), reliability can be measured by testing the stability and consistency. Cronbach's Alpha is a correlation coefficientthat shows the average correlation of the items if all items are standardized. If the results of an instrument are consistent and close to 1, then it is demonstrated as a good reliability (Sau, 2015; Sekaran & Bougie, 2010). Generally, reliability greater than 0.8 is good, 0.7 is acceptable, and less than 0.6 is poor. Having carried out the test, the results are gathered and displayed in Tables 4.3 and 4.4.

Table 4.3 Case Processing Summary

Case Processing Summary

		N	%
Cases	Valid	109	98.2
	Excluded[a]	2	1.8
	Total	111	100.0

a. Listwise deletion based on all variables in the procedure.

Table 4.4 Reliability Statistics

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.985	0.986	38

Table 4.4 showcases that the reliability value is 0.985, implying that all composite variables are reliable.

4.5 Factor Analysis

Factor analysis refers to data reduction technique.Itsummarizes a set of variables in a structure. In fact, factor analysis is used to determine the validity of the items to measure the internal consistency. Kaiser Meyer Olkin (KMO) constitutes the fundamental for factor analysis. The factor analysis for this study has been tested and the details of the obtained results detailed are presented in Table 4.5 as well as the results of the Bartlett's Test.

Table 4.5 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.940
Bartlett's Test of Sphericity	Approx. Chi-Square	5750.418
	df	703
	Sig.	0.000

Yee (2015), Coakes (2013), and Atyo, Adamson and Cant (2001) emphasize that the KMO and Bartlett's test are significant if the measure of sampling adequacy is greater than 0.6. Based on that, with reference to Table 4.5,thesample is this study is considered sufficient or adequate because the KMO value is 0.940, with significant value of 0.000. Therefore, all variables in the questionnaire are considered valid and acceptable. To begin with,Table 4.6 shows the Communalities of the study, Table 4.7 presents the Total Variance Explained, Table 4.8 reveals the Rotated Factor Matrix[3], and Table 4.9displays the Factor Transformation Matrix. On top of that,Appendix E and F provide the remaining tables such as Correlation Matrix and Anti Image Matrices accordingly.

Table 4.6: Communalities

Communalities

	Initial	Extraction
(PU01) Accomplish task more quickly	.889	.798
(PU02) Enhances the quality of work	.948	.850
(PU03) Make job easier	.919	.815
(PU05) Increase productivity	.936	.863
(PU06) Improve job performance	.939	.871
(PEOU02) Clear and understandable	.886	.763
(PEOU03) Easy to become skillful	.910	.743
(PEOU04) Easy to use	.899	.767
(US01) US01-Prototype is very useful	.842	.677
(US03) Satisfied with prototype system	.916	.817
(US04) Prototype has adequate power	.928	.766
(US05) Prototype system is simulating	.931	.896
(US06) Prototype system is flexible	.855	.758
(S01) Screen layout very helpful	.910	.791
(S02) The of information on screen are adequate	.853	.684
(S03) The of information on screen is logical	.923	.780
(S05) Sequences on next screen are predictable	.823	.688
(S06) Sequences on previous screen are possible	.851	.770
(S07) The progression of work clearly marked	.908	.791
(T06) Terminology is on screen precise	.861	.682
(T07) Consistent message on screen	.905	.814
(T09) Prompt for input is clear	.882	.781

Communalities

	Initial	Extraction
(T13) Controlling of feedback is easy	.854	.706
(T14) Length of delay is acceptable	.874	.761
(T15) Error messages prompt is helpful	.866	.709
(T16) Error messages always clarify problem	.855	.709
(T17) Phrasing of error messages is pleasant	.936	.819
(L03) Time to learn is fast	.835	.671
(L04) Task performed in straight forward manner	.870	.716
(L05) Number of steps is just right	.839	.757
(L06) Complete task is logical sequence	.899	.803
(L07) Feedback of completion is clear	.897	.770
(C01) Fast enough	.899	.810
(C02) Response time is fast enough	.907	.802
(C03) Rate displayed is fast enough	.896	.830
(C04) Reliable	.883	.758
(C05) System failure seldom occured	.868	.755
(C06) System always warns about potential problem	.856	.711

Extraction Method: Principal Axis Factoring.

Referring toTable 4.6, (L03), "time to learn is fast", which is listed in the extraction column represents the lowest communality. In Table 4.7, the results of the Total Variance Explained are displayed in three stages. First, the initial eigenvalues explain the factors and its eigenvalues, whilethe percentage of variance at that initial

eigenvalues stage examines the cumulative percentages. For this reason, if the eigenvalues is greater than 1, this study would be expected to extract factor revised (Coakes, 2013). Thus, in this study, four factors were extracted because their eigenvalues are greater than 1 whilst 77% of the variance would be examined.

Table 4.7: Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	24.958	65.679	65.679	24.730	65.078	65.078	10.901	28.686	28.686
2	2.132	5.610	71.289	1.906	5.015	70.094	7.142	18.795	47.481
3	1.732	4.558	75.848	1.533	4.035	74.129	6.175	16.250	63.731
4	1.316	3.464	79.311	1.091	2.871	77.001	5.043	13.270	77.001
5	.827	2.177	81.488						
6	.722	1.899	83.387						
7	.620	1.632	85.019						
8	.562	1.479	86.498						
9	.503	1.323	87.821						
10	.422	1.112	88.933						
11	.404	1.062	89.995						
12	.388	1.022	91.017						
13	.350	.920	91.937						
14	.314	.825	92.763						
15	.262	.689	93.452						
16	.244	.642	94.094						
17	.228	.600	94.694						
18	.204	.536	95.230						
19	.201	.530	95.760						
20	.189	.498	96.258						
21	.174	.458	96.716						
22	.152	.399	97.115						
23	.145	.381	97.496						
24	.128	.337	97.833						
25	.108	.284	98.117						
26	.094	.248	98.365						
27	.086	.227	98.592						
28	.079	.207	98.800						
29	.072	.190	98.990						
30	.065	.172	99.162						
31	.055	.145	99.307						
32	.054	.142	99.449						
33	.049	.129	99.577						
34	.043	.113	99.690						
35	.037	.097	99.788						
36	.035	.091	99.879						
37	.023	.062	99.940						
38	.023	.060	100.000						

Table 4.8 shows the Rotated factor Matrix[3] or known as Varimax rotation. In this study, factor 1 consists of 34 factors loading with values ranging between 0.302 and 0.768. Factor 2 comprises of 26 factors loading with values ranging between 0.312 and 0.781. Factor 3 has 19 factors loading with values ranging between 0.308 and 0.824. Finally, factor 4 indicates 1 factor loading with values ranging between 0.324 and 0.737. Usually, rotation would improve the interpretation and could reduce a number of complex variables. If the items have more than one factor loading greater than 0.3, this itemcauses a simple structure that is not apparent and must be interpreted with caution (Coakes, 2013).

Table 4.8:Rotated Factor Matrix[3]

Rotated Factor Matrix[a]

	Factor			
	1	2	3	4
(L07) Feedback of completion is clear	.793			
(S06) Sequences on previous screen are possible	.768			.329
(L05) Number of steps is just right	.711	.343		
(L06) Complete task is logical sequence	.710	.367		.337
(S05) Sequences on next screen are predictable	.705			.364
(L04) Task performed in straight forward manner	.703		.363	
(S03) The of information on screen is logical	.701			.444
(T13) Controlling of feedback is easy	.693		.325	
(T09) Prompt for input is clear	.685	.460	.313	
(PEOU04) Easy to use	.673	.356		.374
(T17) Phrasing of error messages is pleasant	.668	.385	.449	
(T07) Consistent message on screen	.657	.486		
(L03) Time to learn is fast	.629	.416		
(S01) Screen layout very helpful	.628	.314		.484
(T16) Error messages always clarify problem	.604	.419	.387	
(S07) The progression of work clearly marked	.601	.400	.316	.412
(T15) Error messages prompt is helpful	.586	.427	.364	
(T06) Terminology is on screen precise	.568	.447	.330	
(S02) The of information on screen are adequate	.566			.521
(T14) Length of delay is acceptable	.524	.498	.465	
(PU02) Enhances the quality of work	.302	.781		

Rotated Factor Matrix[a]

	Factor			
	1	2	3	4
(PU06) Improve job performance		.752		.414
(PU03) Make job easier	.304	.736	.340	
(PU01) Accomplish task more quickly	.307	.716		.335
(PU05) Increase productivity	.329	.675		.538
(PEOU02) Clear and understandable	.396	.648	.400	
(PEOU03) Easy to become skillful	.455	.610		
(C01) Fast enough			.824	
(C05) System failure seldom occured			.788	
(C02) Response time is fast enough			.783	
(C06) System always warns about potential problem	.324		.733	
(C03) Rate displayed is fast enough	.304	.312	.732	.324
(C04) Reliable	.467	.443	.533	
(US05) Prototype system is simulating	.339	.389		.737
(US06) Prototype system is flexible	.335		.393	.647
(US04) Prototype has adequate power	.356	.397		.632
(US03) Satisfied with prototype system	.450	.389	.308	.608
(US01) US01-Prototype is very useful	.414	.337		.574

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 8 iterations.

Table 4.9:Factor Transformation matrix

Factor Transformation Matrix

Factor	1	2	3	4
1	.632	.496	.436	.405
2	-.566	.159	.792	-.165
3	.487	-.681	.408	-.365
4	-.208	-.515	.125	.822

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.

4.6 Correlation Analysis

Correlation is to measure the level of relationship between two variables in a linear fashion. Sau (2015) and Cooper and Schindler (2003) state that when establishing the correlation between variables, there is no exact scale or absolute degree that has multicollinearity. Adibah (2015), Sau (2015), Hair, Money, Samouel and Page (2008),and Guilford (1956) have categorized the correlation based on statistical values, which implicates the relationship. The relationship is very weak for correlation below 0.20. Correlations between 0.20 and 0.40 indicate a weak relationship while between 0.40 and 0.70 makes a moderate relationship. When the correlation is between 0.70 and 0.90, the relationship is strong. The best is when the correlation is greater than 0.90 because it represents a very strong correlation relationship. In determining the correlation between independent and dependent variables, this study run Pearson's correlation as suggested by Abdi (2015).

Table 4.10: Bivariate Pearson Product Moment Correlation

Correlations

		PU	PEOU	US	S	T	L	C
PU	Pearson Correlation	1	.805**	.784**	.731**	.778**	.723**	.669**
	Sig. (1-tailed)		.000	.000	.000	.000	.000	.000
	N	110	110	110	110	110	110	110
PEOU	Pearson Correlation	.805**	1	.773**	.786**	.866**	.786**	.695**
	Sig. (1-tailed)	.000		.000	.000	.000	.000	.000
	N	110	110	110	110	110	110	110
US	Pearson Correlation	.784**	.773**	1	.812**	.779**	.748**	.700**
	Sig. (1-tailed)	.000	.000		.000	.000	.000	.000
	N	110	110	110	110	110	110	110
S	Pearson Correlation	.731**	.786**	.812**	1	.843**	.883**	.665**
	Sig. (1-tailed)	.000	.000	.000		.000	.000	.000
	N	110	110	110	110	110	110	110
T	Pearson Correlation	.778**	.866**	.779**	.843**	1	.887**	.765**
	Sig. (1-tailed)	.000	.000	.000	.000		.000	.000
	N	110	110	110	110	110	110	110
L	Pearson Correlation	.723**	.786**	.748**	.883**	.887**	1	.686**
	Sig. (1-tailed)	.000	.000	.000	.000	.000		.000
	N	110	110	110	110	110	110	110
C	Pearson Correlation	.669**	.695**	.700**	.665**	.765**	.686**	1
	Sig. (1-tailed)	.000	.000	.000	.000	.000	.000	
	N	110	110	110	110	110	110	110

**. Correlation is significant at the 0.01 level (1-tailed).

Table 4.10 portrays the results of the Bivariate Pearson Product Moment Correlation test, which intends to interpret the correlation coefficient. The threshold is $p < 0.05$ as suggested byCoakes (2013). With reference to the table, all relationships among the composite factors are significantly positive. Particularly, PU and PEOU has a significant positive relationship ($r = 0.805$, $p < 0.05$). The relationship between PU and US, PU and S, PU and T, PU and L, and PU and C are also significantly positive ($r = 0.784$, $p < 0.05$; $r = 0.731$, $p < 0.05$; $r = 0.778$, $p < 0.05$; $r = 0.723$, $p < 0.05$; and $r = 0.669$, $p < 0.05$ respectively). Therefore, all relationships are correlated.

Similarly, all relationships with PEOU are correlated because they are all significant, particularly, PEOU and US, PEOU and S, PEOU and T, PEOU and L, and PEOU and C which have significant positive relationship ($r = 0.773$, $p < 0.05$; $r = 0.786$, $p < 0.05$; $r = 0.866$, $p < 0.05$; $r = 0.786$, $p < 0.05$; and $r = 0.695$, $p < 0.05$ respectively).

In addition, US and S, US and T, US and L, as well as US and C also have significant positive relationship. These are determined through their significant values ($r = 0.812$, $p < 0.05$; $r = 0.779$, $p < 0.05$; $r = 0.748$, $p < 0.05$; and $r = 0.700$, $p < 0.05$ respectively). Hence, all relationships involving US are correlated.

When S is observed, its relationships with T, L, and C are also found significantly positive. These are seen in their significant values ($r = 0.843$, $p < 0.05$; $r = 0.883$, $p < 0.05$; and $r = 0.665$, $p < 0.05$ respectively). Accordingly,all relationships are correlated. Similar results are obtained when analyzing T. Obviously all relationships through their significant values are significantly positive ($r = 0.887$, $p < 0.05$; $r = 0.765$, $p < 0.05$; and $r = 0.686$, $p < 0.05$ respectively).

4.7 Descriptive Statistics

Descriptive statistics is a pattern and commonly used in the data set. It is used to explore the collected data and to identify the overall range of answers for each construct. For instance, it may be useful if a study wanted to observe about certain data sets. Coakes (2013) outlines four main measures of variability, namely interquartile range, range, variance, and standard deviation.In addition, there are

three main measures of central tendency; mean, mode, and median;which are suitable for interval or ratio data. Table 4.11shows the mean values of the composite factors in the five secondary schools.

Table 4.11: Mean values of the all composite factors in five secondary schools

Statistics

		US	PU	PEOU	S	T	L	C
N	Valid	110	110	110	110	110	110	110
	Missing	0	0	0	0	0	0	0
Mean		3.3400	3.3855	3.4000	3.4773	3.3864	3.4091	3.0909
Median		3.4000	3.6000	3.6667	3.6667	3.5000	3.4000	3.0000
Mode		4.00	4.00	4.00	4.00	4.00	4.00	3.00[a]
Std. Deviation		.74664	.77942	.74986	.68680	.68141	.68074	.85927
Variance		.557	.607	.562	.472	.464	.463	.738
Percentiles	25	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	2.5000
	50	3.4000	3.6000	3.6667	3.6667	3.5000	3.4000	3.0000
	75	4.0000	4.0000	4.0000	4.0000	4.0000	4.0000	4.0000

a. Multiple modes exist. The smallest value is shown

US: User Satisfaction, PU: Perceived Usefulness, PEOU: Perceived Ease of Use, S: Screen, T: Terminology, L: Learning, C: Capabilities.

Measurement scale: 1- Strongly disagree, 2- Disagree, 3-Moderately disagree, 4- Agree, 5- Strongly agree

Based on Table 4.11, the mean values for all composite variables arecentral at a moderate level (around 3). Particularly, the lowest mean among the composite variables is C (3.0909) while the highest mean is S (3.4773).

Table 4.12: Mean Values for US

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
(US01) US01-Prototype is very useful	110	1.00	5.00	3.3636	.78667
(US03) Satisfied with prototype system	110	1.00	5.00	3.3273	.81397
(US04) Prototype has adequate power	110	1.00	5.00	3.3091	.83221
(US05) Prototype system is simulating	110	1.00	5.00	3.3455	.78327
(US06) Prototype system is flexible	110	1.00	5.00	3.3545	.86296
Valid N (listwise)	110				

Table 4.13: Mean Values for PU

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
(PU01) Accomplish task more quickly	110	1.00	5.00	3.4455	.85226
(PU02) Enhances the quality of work	110	1.00	5.00	3.3909	.83606
(PU03) Make job easier	110	1.00	5.00	3.3636	.84297
(PU05) Increase productivity	110	1.00	5.00	3.3909	.82502
(PU06) Improve job performance	110	1.00	5.00	3.3364	.81587
Valid N (listwise)	110				

Table 4.14: Mean Values for PEOU

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
(PEOU02) Clear and understandable	110	1.00	5.00	3.3273	.81397
(PEOU03) Easy to become skillful	110	1.00	5.00	3.4000	.82618
(PEOU04) Easy to use	110	1.00	5.00	3.4727	.78646
Valid N (listwise)	110				

Table 4.15: Mean Values for S

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
(S01) Screen layout very helpful	110	1.00	5.00	3.4909	.77513
(S02) The of information on screen are adequate	110	1.00	5.00	3.3909	.82502
(S03) The information on screen is logical	110	1.00	5.00	3.5091	.77513
(S05) Sequences on next screen are predictable	110	1.00	5.00	3.4818	.75092
(S06) Sequences on previous screen are possible	110	1.00	5.00	3.5182	.71333
(S07) The progression of work clearly marked	110	1.00	5.00	3.4727	.79804
Valid N (listwise)	110				

Table 4.16: MeanValues for T

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
(T06) Terminology is on screen precise	110	1.00	5.00	3.4727	.67333
(T07) Consistent message on screen	110	1.00	5.00	3.4818	.70035
(T09) Prompt for input is clear	110	1.00	5.00	3.4273	.77174
(T13) Controlling of feedback is easy	110	1.00	5.00	3.3818	.72923
(T14) Length of delay is acceptable	110	1.00	5.00	3.3182	.85598
(T15) Error messages prompt is helpful	110	1.00	5.00	3.3091	.79846
(T16) Error messages always clarify problem	110	1.00	5.00	3.3273	.83621
(T17) Phrasing of error messages is pleasant	110	1.00	5.00	3.3727	.81115
Valid N (listwise)	110				

Table 4.17: Mean Values for L

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
(L03) Time to learn is fast	110	1.00	5.00	3.4455	.76129
(L04) Task performed in straight forward manner	110	1.00	5.00	3.4091	.70770
(L05) Number of steps is just right	110	1.00	5.00	3.3364	.81587
(L06) Complete task is logical sequence	110	1.00	5.00	3.4182	.74664
(L07) Feedback of completion is clear	110	1.00	5.00	3.4364	.77255
Valid N (listwise)	110				

Table 4.18: Mean Values for C

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
(C01) Fast enough	110	1.00	5.00	2.9636	1.03982
(C02) Response time is fast enough	110	1.00	5.00	2.9818	.99523
(C03) Rate displayed is fast enough	110	1.00	5.00	3.1091	.96113
(C04) Reliable	110	1.00	5.00	3.2909	.90204
(C05) System failure seldom occured	110	1.00	5.00	3.0909	.98190
(C06) System always warns about potential problem	110	1.00	5.00	3.1091	.92216
Valid N (listwise)	110				

Table 4.11 to Table 4.18 presentsthe mean values for US, PU, PEOU, S, T, L, and C factors. The values are moderate, around 3.0. The lowest mean among the factors is C, through "APDM speed was not fast enough" (2.97) and "response time of APDM was not fast enough" (2.98). On the other hand, the highest mean is S through"sequences of previous screen were possible" (3.52) and "the information on screen is logical" (3.51).

4.8 Analysis of Variance (ANOVA)

In general, multiple regression isa continuation of bivariate correlation. The best conjectures of dependent from a few independent variables are based on the results of regression that represents the equation (Coakes, 2013). There are three main points of regression; standard or simultaneous, hierarchical, and stepwise regression. Nur Fatin Md Khalid (2015) uses multiple regression to test her hypotheses. Most compelling evidence is the use of ANOVA to test the one to one relationship between independent and dependent variables.Indeed, the multiple regression was used to test more than one independent variables to one dependent variable (Haslina Mohd, 2009; Sekaran, 2002; Coakes & Shevlin, 2001) to ensure the level of the observed variable. Nevertheless, in order to identify the relationship between variables, the normality among variables must be tested first. In regards to that, a scatter plot technique was used(See Appendix G)to verify either the normality can be tested using ANOVA between the observed variable.

The formulated hypotheses are:

H_1: Screen has significant relationship to Perceived Usefulness.

H_2: Screen has significant relationship to Perceived Ease of Use.

H_3: Terminology has significant relationship to Perceived Usefulness.

H_4: Terminology has significant relationship to Perceived Ease of Use.

H_5: Learning has significant relationship to Perceived Usefulness.

H_6: Learning has significant relationship to Perceived Ease of Use.

H_7: System Capabilities has significant relationship to Perceived Usefulness.

H_8: System Capabilities has significant relationship to Perceived Ease of Use.

H_9: Perceived Usefulness has significant relationship to User Satisfaction.

H_{10}: Perceived Ease of Use has significant relationship to User Satisfaction.

Among all hypotheses, $H_1$to H_8 were tested using ANOVA while H_9 and H_{10} using multiple regression because both H_9 and H_{10} consist of composite factors. A hypothesis is accepted if (1) P isless than 0.01 or 0.05, at 95% confidence level (Sekaran, 2003) and (2) F value is greater than 5.45 at 0.01 significant level and F value is greater than 3.45 at 0.05 significant level (Ari et al., 2002). Having the data tested, results of H_1 through H_8 for SIS are presented inTable 4.19.

Table 4.19: Summary of ANOVA

Hypothesis	R	R^2	F	Confidence Level at 95 % / Significance	Hypothesis Reject/ Accept	Std. Error of Estimation
H_1	0.731[a]	0.534	123.659	0.000	Accept	0.535
H_2	0.786[a]	0.617	174.336	0.000	Accept	0.466
H_3	0.778[a]	0.605	165.700	0.000	Accept	0.492
H_4	0.866[a]	0.751	324.923	0.000	Accept	0.376
H_5	0.723[a]	0.523	118.301	0.000	Accept	0.541
H_6	0.786[a]	0.618	174.585	0.000	Accept	0.466
H_7	0.669[a]	0.447	87.332	0.000	Accept	0.582
H_8	0.695[a]	0.483	101.085	0.000	Accept	0.541

The hypotheses is acceptable if: The F value > 3.45 at 0.05 level, and F value > 5.45 at 0.01 level (Ari et al., 2002).

Table 4.19shows the results of the ANOVA tests. Since the significant values are very high (0.000), all hypotheses are accepted.

4.9 Multiple Regression Analysis

The tablesin this sectionshow the selected multiple regressions. Simultaneous regression analysis is the best model that fits this study.

Table 4.20: Descriptive Statistics

Descriptive Statistics

	Mean	Std. Deviation	N
US	3.3400	.74664	110
PU	3.3855	.77942	110
PEOU	3.4000	.74986	110
S	3.4773	.68680	110
T	3.3864	.68141	110
L	3.4091	.68074	110
C	3.0909	.85927	110

Table 4.21: Correlations

Correlations

		US	PU	PEOU	S	T	L	C
Pearson Correlation	US	1.000	.784	.773	.812	.779	.748	.700
	PU	.784	1.000	.805	.731	.778	.723	.669
	PEOU	.773	.805	1.000	.786	.866	.786	.695
	S	.812	.731	.786	1.000	.843	.883	.665
	T	.779	.778	.866	.843	1.000	.887	.765
	L	.748	.723	.786	.883	.887	1.000	.686
	C	.700	.669	.695	.665	.765	.686	1.000
Sig. (1-tailed)	US	.	.000	.000	.000	.000	.000	.000
	PU	.000	.	.000	.000	.000	.000	.000
	PEOU	.000	.000	.	.000	.000	.000	.000
	S	.000	.000	.000	.	.000	.000	.000
	T	.000	.000	.000	.000	.	.000	.000
	L	.000	.000	.000	.000	.000	.	.000
	C	.000	.000	.000	.000	.000	.000	.
N	US	110	110	110	110	110	110	110
	PU	110	110	110	110	110	110	110
	PEOU	110	110	110	110	110	110	110
	S	110	110	110	110	110	110	110
	T	110	110	110	110	110	110	110
	L	110	110	110	110	110	110	110
	C	110	110	110	110	110	110	110

Pallant (2013) indicates that correlations exist inrelationship between independent and dependent variables of greater than 0.3. Based on that, by referring to Table 4.21, this study concludes that all variables are substantially correlated.

Table 4.22:Coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	.486	.198		2.455	.016	.094	.879					
	PU	.439	.090	.458	4.901	.000	.261	.617	.784	.428	.272	.351	2.846
	PEOU	.402	.093	.404	4.320	.000	.218	.587	.773	.385	.239	.351	2.846
2	(Constant)	.084	.196		.431	.667	-.304	.472					
	PU	.286	.084	.299	3.425	.001	.121	.452	.784	.320	.167	.311	3.217
	PEOU	.117	.108	.117	1.083	.281	-.097	.331	.773	.106	.053	.202	4.956
	S	.508	.121	.468	4.210	.000	.269	.748	.812	.383	.205	.192	5.206
	T	.001	.154	.001	.006	.995	-.304	.306	.779	.001	.000	.120	8.310
	L	-.097	.138	-.089	-.703	.484	-.371	.177	.748	-.069	-.034	.149	6.699
	C	.145	.067	.167	2.178	.032	.013	.278	.700	.210	.106	.401	2.494

a. Dependent Variable: US

Table 4.23: Collinearity Diagnostics

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions						
				(Constant)	PU	PEOU	S	T	L	C
1	1	2.961	1.000	.00	.00	.00				
	2	.029	10.056	.98	.12	.07				
	3	.009	17.848	.01	.88	.92				
2	1	6.909	1.000	.00	.00	.00	.00	.00	.00	.00
	2	.037	13.631	.55	.01	.00	.00	.00	.00	.28
	3	.022	17.817	.34	.09	.04	.01	.00	.01	.62
	4	.015	21.426	.09	.52	.01	.08	.01	.08	.00
	5	.009	28.165	.01	.36	.64	.08	.02	.03	.01
	6	.005	36.922	.00	.02	.12	.67	.26	.19	.04
	7	.003	46.767	.00	.00	.18	.16	.71	.68	.04

a. Dependent Variable: US

Table 4.24:VariablesEntered/Removed

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PU, PEOU[b]	.	Enter
2	C, S, L, T[b]	.	Enter

a. Dependent Variable: US

b. All requested variables entered.

Table 4.25: Model Summary

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.819[a]	.671	.665	.43203
2	.870[b]	.756	.742	.37935

a. Predictors: (Constant), PU, PEOU

b. Predictors: (Constant), PU, PEOU, C, S, L, T

c. Dependent Variable: US

Table 4.26: Anova

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	40.793	2	20.396	109.276	.000[b]
	Residual	19.971	107	.187		
	Total	60.764	109			
2	Regression	45.942	6	7.657	53.209	.000[c]
	Residual	14.822	103	.144		
	Total	60.764	109			

a. Dependent Variable: US

b. Predictors: (Constant), PU, PEOU

c. Predictors: (Constant), PU, PEOU, C, S, L, T

Table 4.27: Excluded Variables

Excluded Variables[a]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	S	.450[b]	5.443	.000	.467	.355	2.814	.268
	T	.312[b]	2.789	.006	.261	.231	4.327	.206
	L	.277[b]	3.116	.002	.290	.359	2.784	.264
	C	.233[b]	3.030	.003	.282	.483	2.071	.307

a. Dependent Variable: US

b. Predictors in the Model: (Constant), PEOU, PU

Table 4.28: Casewise Diagnostics

Casewise Diagnostics[a]

Case Number	Std. Residual	US	Predicted Value	Residual
94	3.067	3.60	2.4365	1.16346

a. Dependent Variable: US

Table 4.29: Residuals Statistics

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.0450	4.6940	3.3400	.64922	110
Std. Predicted Value	-3.535	2.086	.000	1.000	110
Standard Error of Predicted Value	.048	.226	.088	.037	110
Adjusted Predicted Value	1.0523	4.6614	3.3471	.64018	110
Residual	-1.08259	1.16346	.00000	.36876	110
Std. Residual	-2.854	3.067	.000	.972	110
Stud. Residual	-3.556	3.222	-.008	1.043	110
Deleted Residual	-1.68056	1.28398	-.00705	.42784	110
Stud. Deleted Residual	-3.778	3.381	-.011	1.068	110
Mahal. Distance	.777	37.793	5.945	6.307	110
Cook's Distance	.000	.998	.026	.114	110
Centered Leverage Value	.007	.347	.055	.058	110

a. Dependent Variable: US

Haslina Mohd (2009) adds thatmultiple regression analysis would generate 1 or more modelsin identifying the relationship between the variance of independent and dependent variables. Otherwise, the selected model is the best amongst the models

created. The power or beta value (β) is very highwhen it is closed to 1.0 and minimum if the value is 0 (Haslina Mohd, 2009;Yong, 1997). To test this hypothesis, standard (simultaneous) regression analysis was carried out, as the most appropriate model for this study. Haslina Mohd (2009) supports the equation by Miles and Shevlin (2001), which is

$Y = B_1X_1 + B_2X_2 + \ldots + \text{Constant}$

where Y isthe dependent variables and X is the independent variables.

For this study, the mean values between 1 and 1.67 isconsidered as low, between1.68 and 3.34is moderate, and between3.35 and5.00 is considered high.

User Satisfaction Level can be determined through the following formula.

Level of US

$= (B_1PU_1) + (B_2PEOU_2) + (B_3S_3) + (B_4T_4) + (B_5L_5) + (B_6C_6) + \text{constant}$

$= 0.286\ (3.3855) + 0.117\ (3.4) + 0.508\ (3.4773) + 0.01\ (3.3864) + -0.97\ (3.4091) + 0.145\ (3.0909) + 0.84$

$=0.968253+0.3978+1.7664684+0.033864+(-3.306827)+0.4481805+0.84$

$= 1.15$

Based on the calculation, the results show that US level in this study is 1.15, which indicates a low satisfaction. Therefore, this study concludes that the users of APDM are not satisfied because learning to operate the APDM is not easy, getting started the APDM is not easy, and time to learn to use the system is slow. Otherwise, in terms of system capabilities, the speed is average, sometimes slow, and responsetime

fo rmost operations is not fast enough.Besides that, in terms of terminology, most of the users do not understand the terminologies related to the APDM.

The results of regressive analysis on the four independent variables towards User Satisfaction are shown inTables 4.22 through 4.29. The $R^2(0.870^b)$ in the model summary (Table 4.25) shows the correlation of the independent variables PU, PEOU, S, L, T, and C with US as the dependent variable.

Similarly, the $R^2(0.756)$ is used to describe variance. Therefore, the R square explained the $R(0.870)^2$. Based on theANOVA table, the F value of 53.209 is significant at the 0.000^b level. Given these points, F value is actually the first mean square (regression) divided by the second mean square (Residual) [(7.657) / (0.144) = F].

df represents the degree of freedom that corresponding to the first number, which explained the number of independent variables (6), the second number (103) explained the total number of complete responses. The total number of complete responses can be proved by (N-K-1)[(110)-(6)-1], which equal to the total number of completed responses(103).

(N) represents all variables in the equation and (K) represents the number of independent variables. Under those circumstances, coefficients table will classify which of the independent variables impact variance in US the most.

Therefore, in the coefficient table, the Beta's column under standardized coefficient shows the highest number of -0.089 for learning (L), which was significant at the 0.000^{b} level.

4.10 Summary of the Chapter

This chapter describes the overall findings of this study based on the various data analyses.

CHAPTER FIVE
DISCUSSIONS

5.1 Overview

This chapter discusses the findings presented in Chapter 4. The chapter begins by providing an overview of the respondents' profiles. This is followed by deliberating the discussions on the results of descriptive statistics, hypotheses testing using the Analysis of Variance (ANOVA), and multiple regression analysis which are related to the variables in the research model. The discussions regarding the mean values of the factors and the validation of the research model are also included.

5.2 Discussion of Respondents Profiles

Table 4.1 in Chapter 4 shows that five secondary schools with 110 class teachers have involved in this study. Out of the 110 teachers, the lowest number of respondents is from SPK (6). The reason of the small number of participation is mainly due to their busy schedules in getting ready for the "*Sijil Peperiksaan Malaysia* (SPM)" that will start in two weeks. Therefore, most of the teachers in SPK are not available during the data collection period. Most of the participating schools (93.6%) are situated in the rural areas. Among all the participating class teachers, 71.8% of them are female, aged between 41 and 50 years old (47.3%) where 98.2% of them are Malays. Almost all of them (93.6%) are married. Most of the respondents are form 2 and form 3 class teachers (16.4%) with three to four years teaching experience.

5.3 Discussion of the results from Descriptive Statistics (Mean Values)

Tables 5.1, 5.2, and 5.3 summarize the results of the mean values of the related factors in this study which are adapted from the Information Systems (IS) Success Model by DeLone and McLean (1992), Technology Acceptance Model (TAM) by Davis (1989), and Questionnaire User Interface Interaction Satisfaction (QUIS) by Shneiderman (2005).

Table 5.1:Summary of the Mean Values for all factors

Factors	Kubang Pasu Secondary School	Comments
	Mean Values	
1. User Satisfaction (US)	3.340	The highest mean value is Screen (S) (3.477). The lowest mean value is Capabilities (3.091).
2. Perceived Usefulness (PU)	3.386	
3. Perceived Ease of Use (PEOU)	3.400	
4. Screen (S)	**3.477**	
5. Terminology (T)	3.386	
6. Learning (L)	3.409	
7. Capabilities (C)	**3.091**	

Measurement scale: 1-Strongly Disagree; 2-Disagree; 3-Moderately Disagree; 4-Agree; 5-Strongly Agree

Referring to Table 5.1,almost all factors score moderate mean values. The highest mean is Screen (S) factor (3.477) followed by Learning (L) (3.409) and Perceived Ease of Use (PEOU) (3.400). Next are Perceived Usefulness (PU) and Terminology

(T) (3.386). User Satisfaction (US) factor (3.340) is the second lowest while Capabilities (C) (33.091) is the lowest.

Table 5.2: Summary of User Satisfaction, Perceived Usefulness, and Perceived Ease of Use

Factors	**Variables**	**Kubang Pasu Secondary School** **Mean Values**	**Comments**
1.User Satisfaction (US)	1.Prototype is very useful (US01)	**3.363**	The lowest mean value in User Satisfaction (US) is'prototype has adequate power' (US04) (3.309).
	2.Satisfied with prototype system (US03)	3.327	
	3.Prototype has adequate power (US04)	**3.309**	The highest mean value in User Satisfaction (US) is 'prototype is very useful' (US01) (3.363).
	4. Prototype system is simulating (US05)	3.345	
	5. Prototype system is flexible (US06)	3.354	
2.Perceived Usefulness (PU)	1.Accomplish task more quickly (PU01)	**3.445**	The lowest mean value in Perceived Usefulness (PU) is'improve job performance' (PU06)(3.336).

	2. Enhances the quality of work (PU02)	3.390	The highest mean value in Perceived Usefulness (PU) 'accomplish task more quickly' (PU01)(3.445).
	3. Make job easier (PU03)	3.363	
	4. Increase productivity (PU05)	3.390	
	5. Improve job performance (PU06)	**3.336**	
3.Perceived Ease of Use (PEOU)	1. Clear and understandable (PEOU02)	**3.327**	The lowest mean value in Perceived Ease of Use (PEOU) is 'clear and understandable' (PEOU02)(3.327).
	2. Easy to become skillful (PEOU03)	3.340	
	3. Easy to use (PEOU04)	**3.472**	The highest mean value in Perceived Ease of Use (PEOU) is'easy to use' (PEOU04) (3.472)

Measurement scale: 1-Strongly Disagree; 2-Disagree; 3-Moderately Disagree; 4-Agree; 5-Strongly Agree

Referring toTable 5.2, the highest mean value for User Satisfaction (US) factor is scored by'prototype is very useful' (3.363).Thefollowing are as follows; 'prototype system is flexible' (3.354), 'prototype system is simulating' (3.345), 'satisfied with prototype system' (3.327). The lowest is 'prototype has adequate power' (3.309). In general, all US factors have moderate mean score.

The highest mean value for Perceived Usefulness (PU) factors is obtained by‘accomplish task more quickly’ (3.445). The subsequent factors are‘enhances the quality of work’ and ‘increase productivity’ (3.390). The second lowest is ‘make job easier’ (3.363) whilst the lowest is ‘improve job performance’ (3.336). The results indicate that the respondents accept those PU factors positively.

For the Perceived Ease of Use (PEOU) factors, the highest is scored by ‘easy to use’ (3.472), followed by ‘easy to become skillful’ (3.340) while the lowest is ‘clear and understandable’ (3.327). Similar to PU, the participants also view PEOU positively.

Table 5.3: Summary of Sub Factors Screen, Terminology, Learning and Capabilities

Sub Factors	**Variables**	**Kubang Pasu Secondary School** **Mean Values**	**Comments**
1.Screen (S)	1.Screen layout very helpful (S01)	3.490	The lowest mean value in Screen (S) is‘the information on screen are adequate’ (S02)(3.390). The highest mean value in Screen (S) is‘sequences on previous screen are possible’
	2.The information on screen are adequate (S02)	**3.390**	
	3.The information on screen is logical (S03)	3.509	
	4.Sequences on next screen are predictable	3.481	

	(S05)		(S06)(3.518).
	5.Sequences on previous screen are possible (S06)	**3.518**	
	6.The progression of work clearly marked (S07)	3.472	
2.Terminology (T)	1.Terminology is on screen precise (T06)	3.473	The lowest mean value in Terminology (T) is'error messages prompt is helpful' (T15)(3.309).
	2.Consistent message on screen (T07)	**3.482**	
	3.Prompt for input is clear (T09)	3.427	
	4.Controlling of feedback is easy (T13)	3.382	The highest mean value in Terminology (T) is'consistent message on screen' (T07)(3.482).
	5.Length of delay is acceptable (T14)	3.318	
	6.Error messages prompt is helpful (T15)	**3.309**	
	7.Error messages always clarify problem (T16)	3.327	
	8.Phrasing of error	3.372	

	messages is pleasant (T17)		
3.Learning (L)	1.Time to learn is fast (L03)	**3.446**	The lowest mean value in Learning (L) is'number of steps is just right' (L05)(3.336).
	2.Task performed in straight forward manner (L04)	3.409	
	3.Number of steps is just right (L05)	**3.336**	The highest mean value in Learning (L)is'time to learn is fast' (L03)(3.446).
	4.Complete task is logical sequence (L06)	3.418	
	5.Feedback of completion is clear (L07)	3.436	
4.Capabilities (C)	1.Fast enough (C01)	**2.963**	The lowest mean value in Capabilities (C) 'fast enough' (C01) (2.963).
	2.Response time is fast enough (C02)	2.981	
	3.Rate displayed is fast enough (C03)	3.109	
	4.Reliable (C04)	**3.290**	The highest mean value in Capabilities (C) is'reliable' (C04) (3.290).
	5.System failure seldom occurred (C05)	3.090	
	6.System always warns about potential problem (C06)	3.109	

Measurement scale: 1-Strongly Disagree; 2-Disagree; 3-Moderately Disagree; 4-Agree; 5-Strongly Agree

Table 5.3exhibits that the highest mean value of Screen (S) factor is ‘sequences on previous screen are possible’ (3.518). The second is ‘the information on screen is logical’ (3.509), followed by ‘sequences on next screen are predictable’ (3.481), ‘screen layout very helpful’ (3.490), and ‘the progression of work clearly marked’ (3.472). The lowest is ‘the information on screen are adequate’ (3.390). Again, the participants are being positive about the Screen (S) factor.

In terms of the Terminology (T) factor,‘consistent message on screen’ is the highest (3.482), followed by ‘terminology on screen is precise’ (3.473), ‘prompt for input is clear’ (3.427), ‘controlling of feedback is easy’ (3.382), ‘phrasing of error messages is pleasant’ (3.372), ‘error messages always clarify problem’ (3.327), and ‘length of delay is acceptable’ (3.318). The ‘error messages prompt is helpful’ (3.309) is the lowest. Therefore, it can deduced that all participants view the factor positively.

The highest mean value of Learning (L) factor is ‘time to learn is fast’ (3.446), followed by ‘feedback of completion is clear’ (3.436), ‘complete task is logical sequence’ (mean value = 3.418), and ‘task performed in straight forward manner’ (3.409). The lowest is ‘number of steps is just right’ (3.336). Based on the meanscores, the Learning (L) factor has also been viewed by participants positively.

For the Capabilities (C) factor, the highest is scored by ‘reliable’ (3.290). This is followed by ‘rate displayed is fast enough’ and ‘system always warns about potential problem’(3.109), ‘system failure seldom occurred’ (3.090), and ‘response time is fast enough’ (2.981).‘Fast enough’ is the lowest (2.963). Compared to the other factors,

the mean scores for all Capabilities (C) factors is quite low. Nevertheless, the scores can still be accepted as moderate.

User Satisfaction factor is determined based on the results of the Perceived Usefulness and Perceived Ease of Use factors. Under those circumstances, Screen, Terminology, Learning, and Capabilities are also relevant sub factors of Perceived Usefulness and Perceived Ease of Use. These factors are used to get an approximate findings of User Satisfaction factors that influence the adoption of Student Information System.

The only issue relating to the mean score is the low values obtained by the Capabilities (C) factors. However, it does not seriously affected because the mean values are not extremely differs. The only two lowest mean value of all factors are 'fast enough' (2.963) and 'response time is fast enough' (2.981). This conveys that the participants perceive the APDM and its response time as not fast enough. Those factors are somehow influenced by the access time, in which during peak hours and heavy access, the connection tends to slows down. This affects the capability of the system.

The major strength of APDM is Screen (S) which represent one of the User Interface factors. The highest means are obtained by 'sequences on previous screen are possible' (3.518) and 'the information on screen is logical' (3.509). This explains that participants are clear about the screen design and navigation. With that, it strongly contributes to the superiority of APDM.

Table 5.4:Weakest and Strongest items for User Satisfaction (US), Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Screen (S), Terminology (T), Learning (L), and Capabilities (C).

Model	**Factors**	**Kubang Pasu Secondary School**	
		Weakest	Strongest
IS Success Model	1. User Satisfaction (US)	Prototype has adequate power (US04)	Prototype is very useful (US01)
TAM	2. Perceived Usefulness (PU)	Improve job performance (PU06)	Accomplish task more quickly (PU01)
	3. Perceived Ease of Use (PEOU)	Clear and understandable (PEOU02)	Easy to use (PEOU04)
QUIS	4. Screen (S)	The information on screen are adequate (S02)	Sequences on previous screen are possible (S06)
	5. Terminology (T)	Error messages prompt is helpful (T15)	Consistent message on screen (T07)
	6. Learning (L)	Number of steps is just right (L05)	Time to learn is fast (L03)
	7. Capabilities (C)	Fast enough (C01)	Reliable (C04)

Table 5.4 depicts that the strongest item for User Satisfaction is 'the prototype is very useful' while the weakest is 'prototype has less adequate power'. Meanwhile, the strongest item for Perceived Usefulness is the system 'accomplishes tasks more quickly' while the weakest is 'improve the job performance'. This explains that the system is not able to improve users' performance to become more systematic. For Perceived Ease of Use, the strongest is 'the system is easy to use' while the weakest of the system is 'clear and understandable', which implies that the system is not very clear and not well understood. Regarding the Screen, the strongest is 'the sequences on previous screen is possible', while the weakest is 'the information on screen are adequate". This conveys that the on-screen information is not really adequate. In terms of the Terminology,'messages are consistent on screen' is the strongest item, while the weakest is 'the error messages prompt is helpful', which explains that the error messages are not helpful enough for the users. For Learning, the strongest item is 'time to learn is fast' while the weakness is 'number of steps is just right'. This indicates that the number of steps is not efficient, therefore, more are expected. In terms of Capabilities, the strongest item is 'reliable' while the weakness is 'fast enough'. This conveys that the system is a little slower than expected.

5.4 Discussion of the results from Hypotheses testing using Analysis of Variance (ANOVA) and Multiple Regression Analysis

QUIS is composed of four variables; Screen (S), Terminology (T), Learning (L), and Capabilities (C), whilst the TAM model is composed two factors; (1) Perceived Usefulness (PU) and (2) Perceived Ease of Use (PEOU). The IS Success model is composed of one factor namely User Satisfaction (US). By merging the QUIS,

TAM, and IS Success models, 10 hypotheses have been formulated in this study. The results of the Simultaneous Regression Analysis is revealed in multiple regression analysis.

The results of the hypotheses tested between User Interface and System Capabilities and PU, as well as User Interface and System Capabilities and PEOU show a positive significant relationship. Similarly, the results of Entered Multiple Regression show a significant relationship between PU and US and PEOU and US.

5.5 Revisiting the Research Model

The results of this study explain the real issues that influence the implementation of APDM in secondary schools in Kubang Pasu, Kedah as stated in Tables 5.3 and 5.4, in which the technical perspective consists of UI design and System Capabilities. Nevertheless, the findings of this research explain about the model constructed in this study, because all the factors have positive significant relationships. Therefore, the relationships between the factors remain as proposed in the earlier research model. All the relationships have been proven significant.

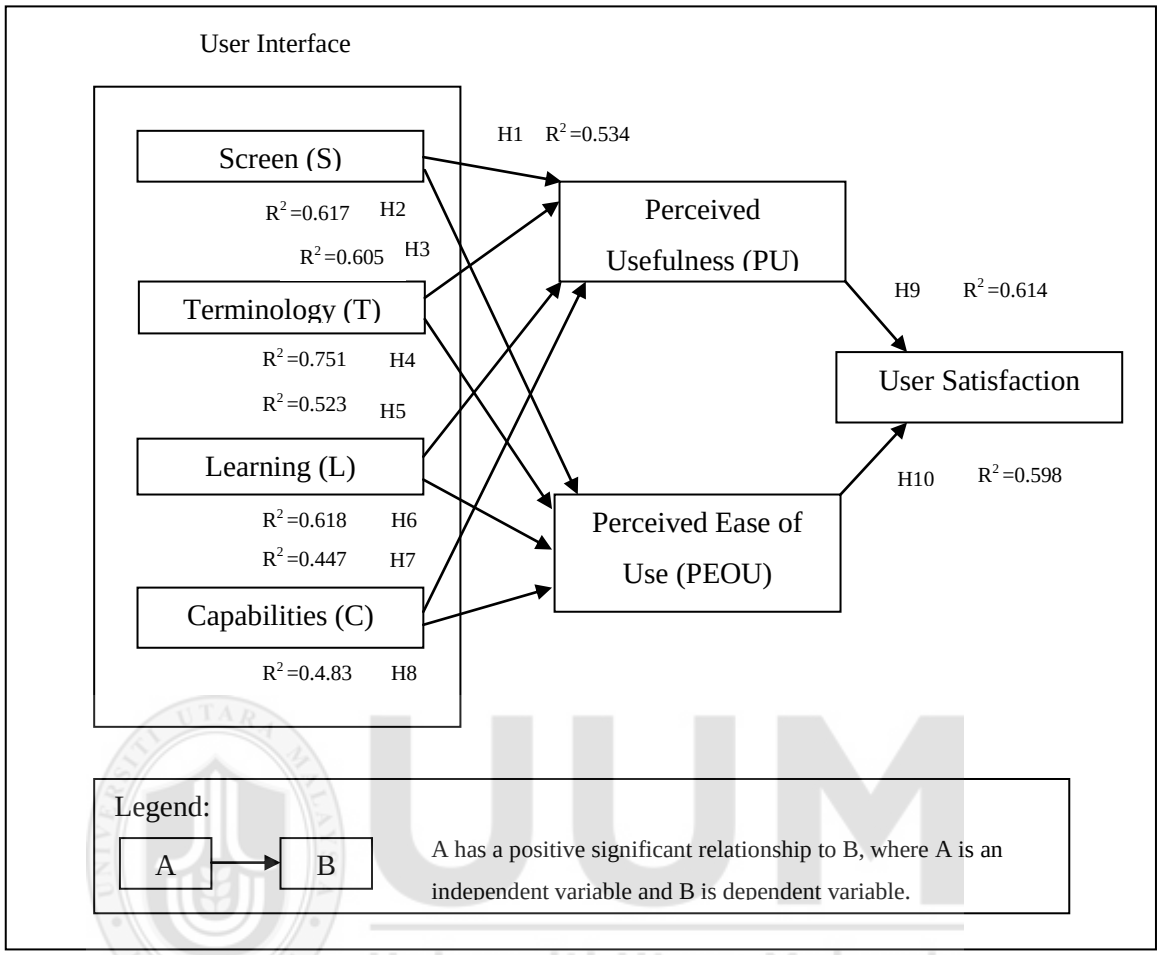

Figure 5.1: A Multiple Perspectives Acceptance Model adopted prepared by Haslina Mohd (2009) referring to Theoretical framework Figure 1.0 (page 26).

5.6 Conclusions

Based on the results, it can be concluded that the factors which complement the APDM from the Technical Perspective include Screen, Learning, Terminology and System Capabilities; from the Social perspectives are PU and PEOU; and from the behavioral perspectives is User Satisfaction. The model used in this study has been adapted from MP-TAM by Haslina Mohd (2009).

CHAPTER SIX

CONCLUSION

6.1 Introduction

This chapter addresses the limitations of this study together with recommendations for future enhancement. This study is carried out to determine the User Interface factors that influence the adoption of APDM in secondary schools in Kubang Pasu, Kedah.

Based on the literatures, as discussed in lengthy in Chapter 2, there are seven potential factors that influence the implementation of APDM; Screen (S), Learning (L), Terminology (T), System Capabilities (C), Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and User Satisfaction (US). This study develops a model by adapting the Multiple Perspectives Technology Acceptance Model (MP-TAM) by Haslina Mohd (2009). In the model, this study only focuses on the User Interface and System Capabilities factors under the technical perspective and the PU and PEOU, and US factors for the non-technical perspectives.

Data have been gathered from five secondary schools in Kubang Pasu, Kedah that are using APDM namely SMK Bandar Baru Sintok, SMK Changlun, SMK Hosba, SMK Mahawangsa, and SMK Paya Kamunting. Based on the results as presented in Chapter 4, this study finds that the model has been fully implemented in the schools. Hence, the class teachers from the five schools were employed as the respondents for

this study. All data were analyzed together since the participating schools are using the same system which was installed by the same vendor, with same user interface, and targeted for the same target group. This study also defines the strongest and weakest items of each factor with regards to the APDM.

The model, as illustrated in Chapter 3, indicates the factors that influence the APDM. Based on the model, two research questions have been generated together with 10 hypotheses that test the relationships among the seven variables; Screen (S), Learning (L), Terminology (T), and System Capabilities (C), Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) and User Satisfaction (US).

The survey was conducted in five secondary schools in Kubang Pasu, Kedah. This is to ensure that this study is able to identify the factors that influence the adoption of APDM, the relationships among factors, and the power of the relationships among the factors based on the beta value. The following sections discuss about the achievement of the outlined objectives, major findings, contribution and limitations of the study, as well as recommendations for future enhancement.

6.2 Discussion on Achievement of Research Objectives

This study attempts to answer two research questions:

1. What are the User Interface design factors that influence the adoption of Student Information System (SIS).

2. What are the relationships among the User Interface design factors with Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and User Satisfaction (US).

The objectives of this study are (1) to determine the user interface design factors that affect the APDM adoption from the behavioral perspective, (2) to identify the relationship among the adoption factors, and (3) to validate the User Interface design factors that influence the APDM adoption from the behavioral perspective using statistical analysis technique.

6.2.1 Factors that influence the APDM adoption

The factors in the model were adapted from the MP-TAM model by Haslina Mohd (2009). The identified factors and variables have been proven to have influence on the APDM adoption. Table 6.1 shows that Haslina Mohd (2009) classifies the factors into three perspectives: Technical, Social, and Behavioral. This study determines the relationship among those variables as illustrated in Figure 5.1.

Table 6.1: APDM factors in technical, Social and behavioral perspectives adapted from Haslina Mohd (2009)

Factors	Variables
Technical Perspective	
User Interface factors (UI)	1.Screen (S)

	2.Learning (T) 3.Terminology (L) 4.System Capabilities (C)
Social Perspective	
Perceived Usefulness (PU)	1.Accomplish task more quickly 2.Improve job performance 3.Increase productivity 4.Enhance job effectiveness 5.Make job easier 6.Useful in job
Perceived Ease of Use (PEOU)	1.Easy to learn 2.Easy to control 3.Clear and understandable 4.Flexible in interaction 5.Easy to become skillful 6.Easy to use
Behavioral Perspective	
User Satisfaction (US)	1.US-Helpful 2.US-Easy 3.US-Satisfying 4.US-Adequate 5.US-Stimulating 6.US-Flexible

6.2.2 The Relationships among the Factors

The validation of the model was based on the relationships among the variables using Linear Regression and Multiple Regression Analysis. The relationships among the factors in the model are shown through 10 hypotheses, which are summarized in Table 6.2.

Table 6.2: Summary of the Accepted Hypotheses among the Factors based on the Developed Model

Hypotheses	**APDM**
	Variance (R^2)
H_1: Screen has a relationship with Perceived Usefulness	0.534
H_2: Screen has a relationship with Perceived Ease of use	0.617
H_3: Terminology has a relationship with Perceived Usefulness	0.605
H_4: Terminology has a relationship with Perceived Ease of use	0.751
H_5: Learning has a relationship with Perceived Usefulness	0.523
H_6: Learning has a relationship with Perceived Ease of use	0.618
H_7: SystemCapabilities has a relationship with Perceived Usefulness	0.447
H_8: System Capabilities has a relationship with Perceived Ease of use	0.483
H_9: Perceived Usefulness has a relationship with User Satisfaction LUS = β1PU1 + β2PEOU2 + constant = (0.439*3.3855) + (0.402*3.4) + 0.486	0.614

=3.339 LUS = (β1PU1) + (β2PEOU2) + (β3S3) + (β4T4) + (β5L5) + (β6C6) + constant =(0.286*3.3855)+(0.117*3.4)+(0.508*3.4773)+(0.01*3.3864) +(-0.97*3.4091)+(0.145*3.0909)+0.84 =1.15	
H_{10}: Perceived Ease of use has a relationship with User Satisfaction LUS = β1PU1 + β2PEOU2 + constant = (0.439*3.3855) + (0.402*3.4) + 0.486 =3.339 LUS = (β1PU1) + (β2PEOU2) + (β3S3) + (β4T4) + (β5L5) + (β6C6) + constant =(0.286*3.3855)+(0.117*3.4)+(0.508*3.4773)+(0.01*3.3864) +(-0.97*3.4091)+(0.145*3.0909)+0.84 =1.15	0.671

6.2.3 Strengths and Relationships among Factors

Haslina Mohd (2009), Miles and Shevlin (2001), and Cohen et al.(1983), argue that the relationships among the factors can be measured through variance (R^2) and the beta value (β) to identify how strongly the predictor variable influences the criterion variable. The results from the Entered Multiple Regression Analysis showcase that the User Satisfaction (US) level of APDM is 1.15, which is low. PU factor contributes about 61.4%, and PEOU contributes about 59.8% towards the level of User Satisfaction (US). Another, Screen (S) contributes about 53.4%, Terminology (T) contributes 60.5%, Learning (L) contributes 52.3%, and System Capabilities (C) contributes 44.7% towards PU. On the other hand, Screen (S) contributes about 61.7%, Terminology (T) contributes 75.1%, Learning (L) contributes 61.8%, and System Capabilities (C) contributes 48.3% towards PEOU. Therefore, it can be deduced that Terminology influences PEOU more compared to the other factors. Capabilities also contribute the lowest score towards PU,which indicates that PU is moderately influenced by System Capabilities.

6.2.4 Issues Related to APDM

The findings of this study address the issues in all factors; UI design, PU and PEOU, and US that influence the adoption of APDM in secondary schools. The findings also highlight the issues related to the User Interface and System Capabilities of the APDM used in the five secondary schools in Kubang Pasu, Kedah. Based on the results, the main issues related to System Capabilities, which obtains the lowest mean value of all factors are listed as follows:

1) The system was not fast enough
2) Response time was not fast enough
3) System failure seldom occurred

6.3 Contribution of the Study

Thisstudy contributes in many senses to various fields,including to the educational domain and decision makers of the Malaysia Ministry of Education (MOE). Currently, all schools that are registered with MOE (generally all government schools) are using the APDM, which could be accessed anywhere. APDM plays an important role in introducing SIS in the educational process. Hence, the results of this study, which are the factors that influence the adoption of APDM may benefit schools nationwide. While the research model is adapted from the MP TAM by Haslina Mohd (2009),the focus of this study is mainly on the User Interface design. In addition, the results mayhelp in guiding the development of the system, MOE as the contributor, schools, and teachers especially in order to justify the contributions of APDM to our country mainly in educational institutions.

6.4 Limitations of the Study

This study recognizes a few minor limitations along the process. However, these minor limitations do not affect the results of study. One of the limitations is that data regarding the APDM implementation were gathered from only five schools in Kubang Pasu. The location between each school covers quite a distance. Secondly,

this study have to get a permission from the MOE and Jabatan Pelajaran Negeri (JPN) Kedah for collecting data. This leads to a waste of time. Thirdly, only 110 usable questionnaires were successfully collected from the teachers because most of them were busy with their preparation for Sijil Pelajaran Malaysia (SPM) examination.

6.5 Future Research

As a response to the limitations outlined in Section 6.4, this section recommends some actions for future enhancement. Firstly, the sample of schools can be increased, involving various other districts in Kedah, and also involve other states in Malaysia. On the other hand, the model could also be added with other factors such as Information Quality (IQ) as well as other suitable theories suitable for the purpose of conducting similar study so that richer findings can be achieved. Eventually, more parties can receive the benefits. However, this may require a bigger budget as this could lead to a policy in the national education system. Therefore, investments by the government are necessary.

6.6 Conclusion

This study determines the factors that influence the implementation of APDM among secondary school class teachers. The factors are User Satisfaction (US), Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Screen (S), Learning (L), Terminology (T) and Capabilities (C). The findings are presented in details in

Chapter 4 by describing significant influence of User Interface design towards the adoption of APDM from the behavioral perspectives. This study has also achieved its objective to determine the relationships among the adapted factors of APDM and validate the User Interface design factor from the behavioral perspectives based on the Multiple Perspectives Technology Acceptance Model (MP-TAM) adopted from Haslina Mohd (2009).

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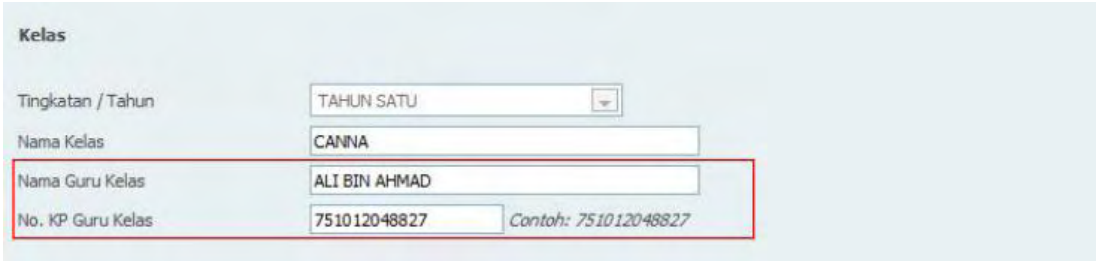
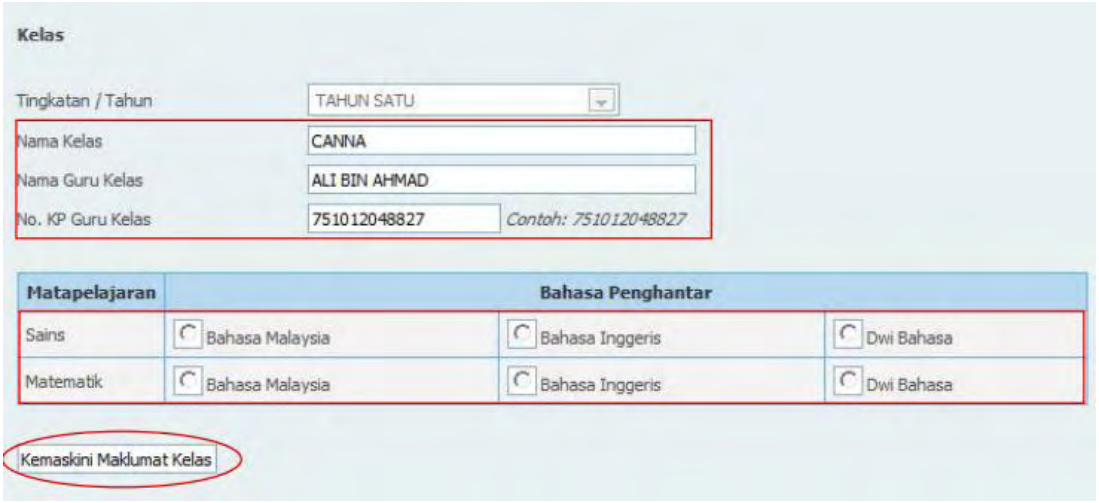
Appendix A

"Aplikasi Pangkalan Data Murid" (APDM)






Aplikasi
Data Murid
Utiliti
Laman Utama
Log Keluar
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Padam Murid
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No. Sijil Lahir
BQ18539
Nama
AINUL HAZYAH BINTI NORHISHAMUDIN
Sebab Padam
--PILIH SEBAB PADAM--
Padam Murid
--PILIH SEBAB PADAM--
Berhenti Sekolah
Berpindah Ke Luar Negara
Berpindah Ke Sekolah Agama Rakyat
Berpindah Ke Sekolah Swasta
Lapor Diri
Meninggal Dunia
Mohon Pertukaran Antara Negeri
Mohon Pertukaran Dalam Negeri
Tiada Maklumat
Tidak Lapor Diri


Aplikasi
Data Murid
Utiliti
Laman Utama
Log Keluar
HASLINDA BINTI KAMARUDDIN
Jumlah Murid : 15
Kelas : D1 GIGIH
No. KP Nama Daftar Murid
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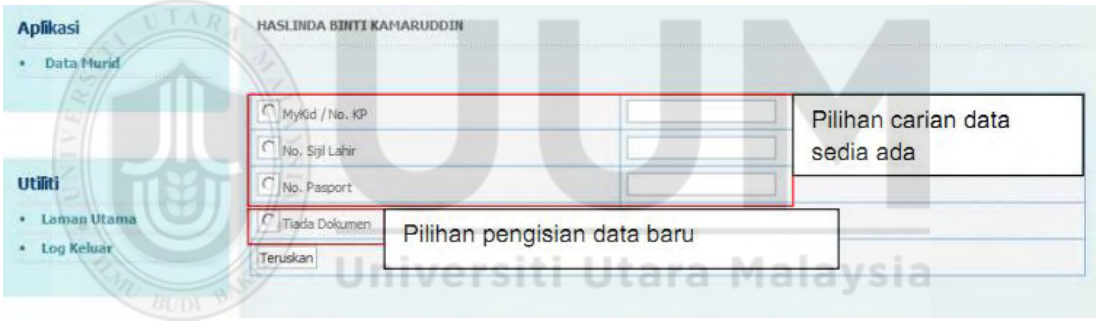
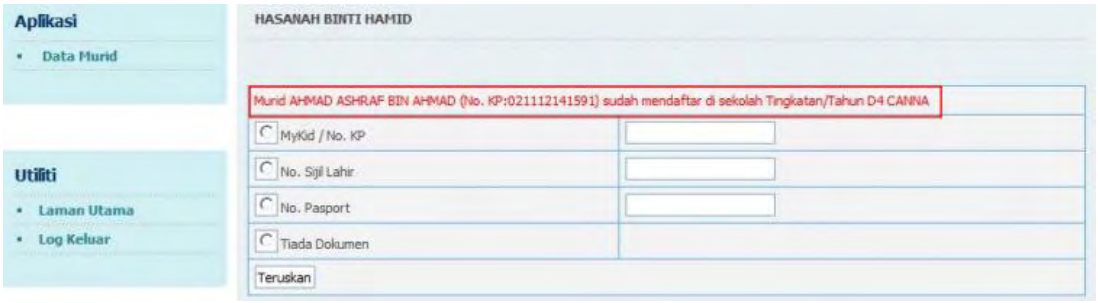
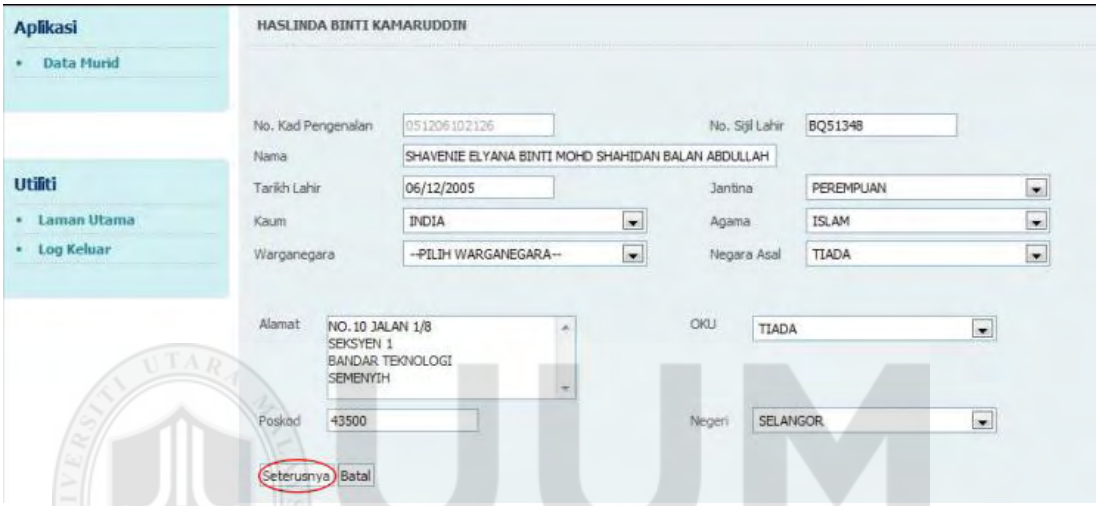
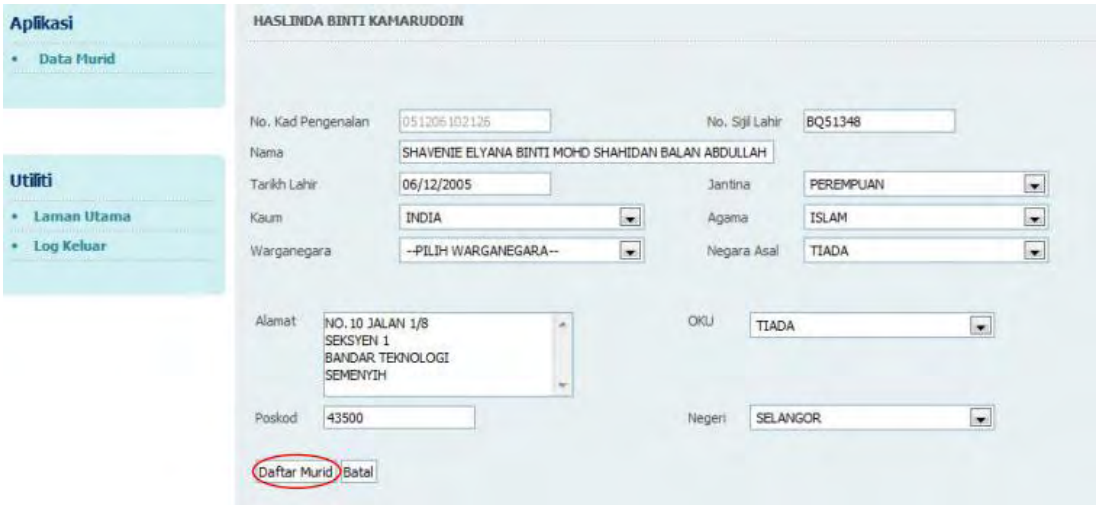
2 050113100709 AZ DANISH FARHANSHAH BIN ZAMRI Padam Kemaskini Kelas
3 051221030087 DANISH FIRDAUS BIN FARID Padam Kemaskini Kelas
4 051109101359 FIZI PUTRA BIN AMIR Padam Kemaskini Kelas
5 050924101457 MEOR QARMEN AQIL BIN MUHAMMAD JOHAN HAIQAL LAMA Padam Kemaskini Kelas
6 051103030641 MOHAMAD FAIZ SYAWAL BIN MOHAMAD ZAKI Padam Kemaskini Kelas
7 051230140181 MUHAMMAD AFIQ FARIHIN BIN NAZRI Padam Kemaskini Kelas
8 051027100619 MUHAMMAD AKMAL BIN AHMAD SHUKRI Padam Kemaskini Kelas
9 050918140193 MUHAMMAD SHAZRIL HAIKAL BIN SHAIFUL ANUAR Padam Kemaskini Kelas
10 050528100583 MUHAMMAD SYAKIR HARITH BIN SUGIMAN Padam Kemaskini Kelas
11 051218101470 NUR AILAH AILIN BINTI HAZWAN Padam Kemaskini Kelas
12 050829100210 NUR AMIRA BALQIS BINTI SAZALI Padam Kemaskini Kelas
13 050205100888 SITI NURATIKAH BINTI FAUZUFUADI Padam Kemaskini Kelas
14 050719100703 SYAIFULLAH BIN SYAMSURI Padam Kemaskini Kelas
15 050927141593 WAN MUHAMMAD IZUAN AZRI BIN AZAM Padam Kemaskini Kelas


Aplikasi
Data Murid
Utiliti
Laman Utama
Log Keluar
HASLINDA BINTI KAMARUDDIN
Jumlah Murid : 15
Kelas : D1 GIGIH
No. KP Nama Daftar Murid
1 051224050438 AINUL HAZYAH BINTI NORHISHAMUDIN Padam Kemaskini Kelas
2 050113100709 AZ DANISH FARHANSHAH BIN ZAMRI Padam Kemaskini Kelas
3 051221030087 DANISH FIRDAUS BIN FARID Padam Kemaskini Kelas
4 051109101359 FIZI PUTRA BIN AMIR Padam Kemaskini Kelas



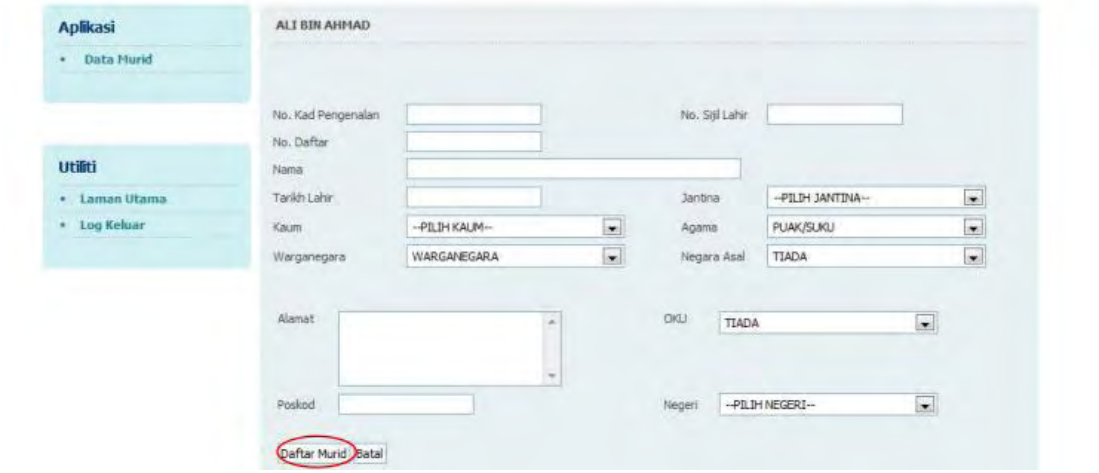


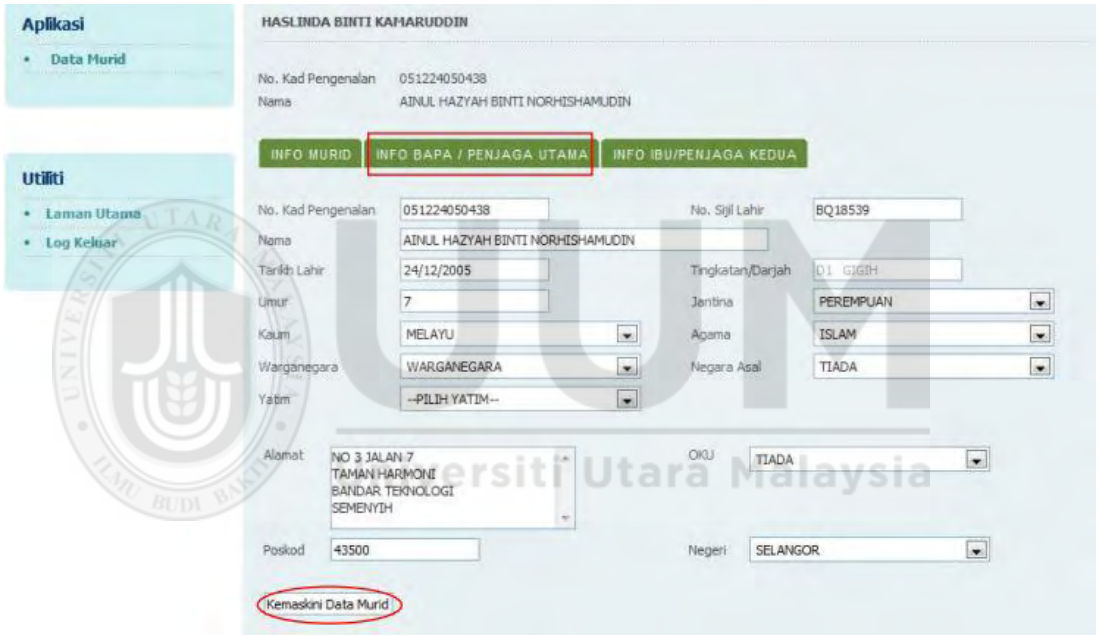


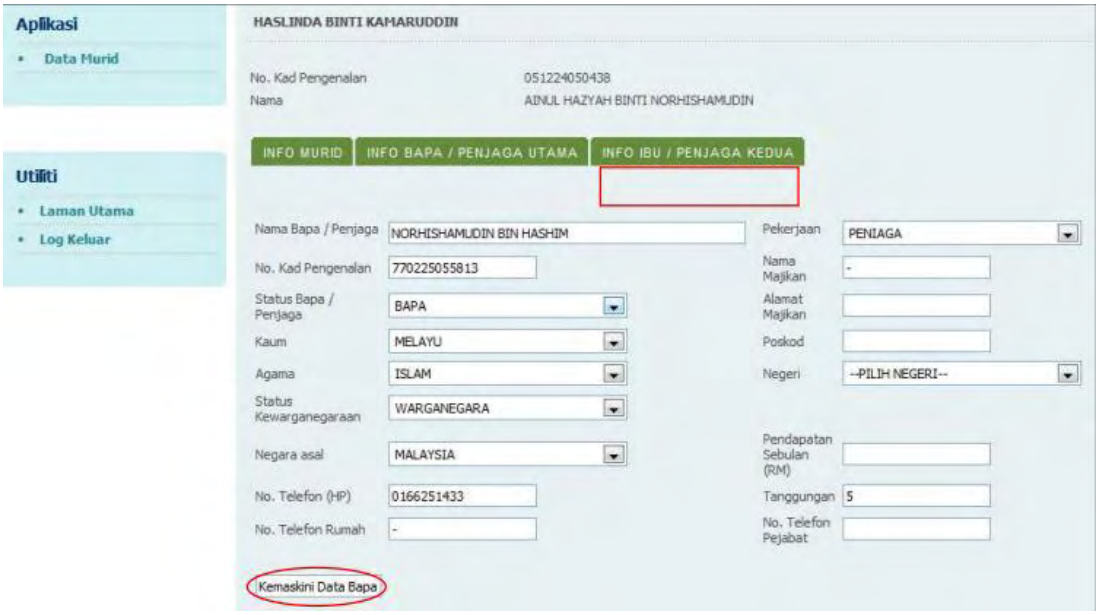

Aplikasi
Data Murid
Utiliti
Laman Utama
Log Keluar
HASLINDA BINTI KAMARUDDIN
No. Kad Pengenalan
051206102126
No. Sijil Lahir
BQ51348
Nama
SHAVENIE ELYANA BINTI MOHD SHAHIDAN BALAN ABDULLAH
Tarikh Lahir
06/12/2005
Jantina
PEREMPUAN
Kaum
INDIA
Agama
ISLAM
Warganegara
--PILIH WARGANEGARA--
Negara Asal
TIADA
Alamat
NO. 10 JALAN 1/8
SEKSYEN 1
BANDAR TEKNOLOGI
SEMENYIH
OKU
TIADA
Poskod
43500
Negeri
SELANGOR
Daftar Murid
Batal

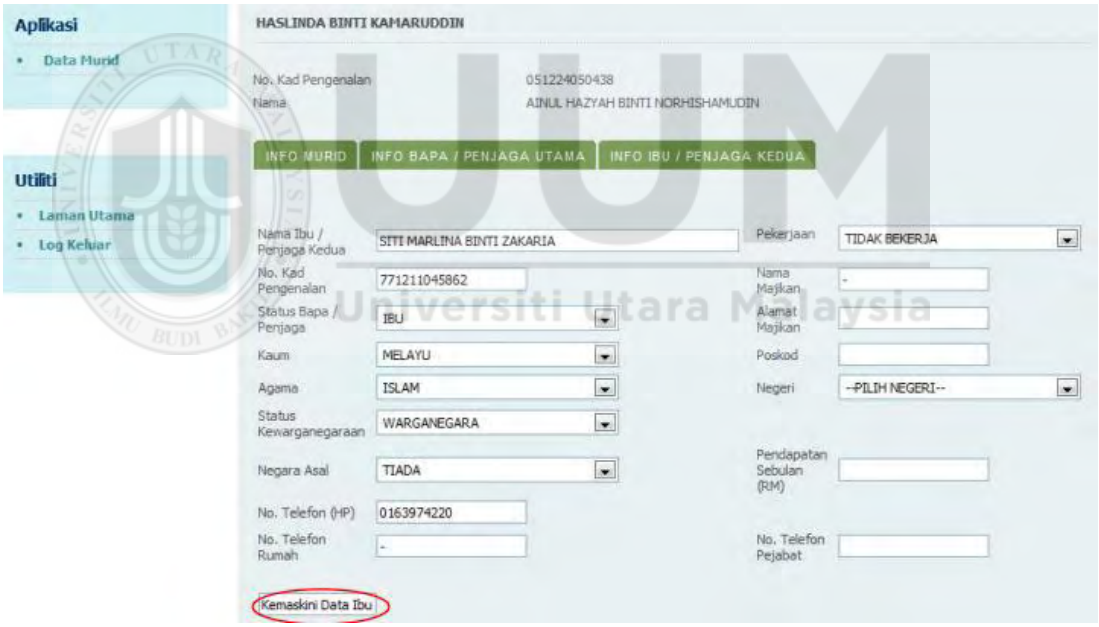

Aplikasi
Data Murid
Utiliti
Laman Utama
Log Keluar
HASLINDA BINTI KAMARUDDIN
MyKid / No. KP
No. Sijil Lahir
No. Pasport
Tiada Dokumen
Teruskan


Pangkalan Data Murid
KEMENTERIAN PELAJARAN MALAYSIA
"SEKOLAH UNGGUL, PENJANA GENERASI GEMILANG"


Aplikasi
Data Murid
Utiliti
Laman Utama
Log Keluar
ALI BIN AHMAD
No. Kad Pengenalan
No. Sijil Lahir
No. Daftar
Nama
Tarikh Lahir
Jantina
--PILIH JANTINA--
Kaum
--PILIH KAUM--
Agama
PUAK/SUKU
Warganegara
WARGANEGARA
Negara Asal
TIADA
Alamat
OKU
TIADA
Poskod
Negeri
--PILIH NEGERI--
Daftar Murid
Batal







Appendix B

Letter of Permissions

BAHAGIAN PERANCANGAN DAN PENYELIDIKAN DASAR PENDIDIKAN
KEMENTERIAN PENDIDIKAN MALAYSIA
ARAS 1-4, BLOK E-8
KOMPLEKS KERAJAAN PARCEL E
PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN
62604 PUTRAJAYA.

Telefon : 03-88846591
Faks : 03-88846579

Ruj. Kami : KP(BPPDP)603/5/JLD.10 (93)
Tarikh : 23 Oktober 2014

Risniah binti Yunus
DPP Tradewinds
Universiti Utara Malaysia
06010 Sintok
Kedah

Tuan/Puan,

Kelulusan Untuk Menjalankan Kajian Di Sekolah, Institut Pendidikan Guru, Jabatan Pendidikan Negeri Dan Bahagian-Bahagian Di Bawah Kementerian Pendidikan Malaysia

Adalah saya dengan hormatnya diarah memaklumkan bahawa permohonan tuan /puan untuk menjalankan kajian bertajuk:

"The Adoption Of Student Information System in Kedah (SIS)" diluluskan.

2. Kelulusan ini adalah berdasarkan kepada cadangan penyelidikan dan instrumen kajian yang tuan/puan kemukakan ke Bahagian ini. **Kebenaran bagi menggunakan sampel kajian perlu diperolehi dari Ketua Bahagian/Pengarah Pendidikan Negeri yang berkenaan.**

3. Sila tuan/puan kemukakan ke Bahagian ini senaskah laporan akhir kajian/laporan dalam bentuk elektronik berformat Pdf di dalam CD bersama naskah *hardcopy* setelah selesai kelak. Tuan/Puan juga diingatkan supaya mendapat kebenaran terlebih dahulu daripada Bahagian ini sekiranya sebahagian atau sepenuhnya dapatan kajian tersebut hendak dibentangkan di mana-mana forum atau seminar atau diumumkan kepada media massa.

Sekian untuk makluman dan tindakan tuan/puan selanjutnya. Terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,

(DR. HJ. ZABANI BIN DARUS)
Ketua Sektor
Sektor Penyelidikan dan Penilaian
b.p. Pengarah
Bahagian Perancangan dan Penyelidikan Dasar Pendidikan
Kementerian Pendidikan Malaysia

JABATAN PENDIDIKAN NEGERI KEDAH DARUL AMAN
KOMPLEKS PENDIDIKAN, JALAN STADIUM
05604 ALOR SETAR
KEDAH DARUL AMAN
No. Telefon : 04-740 6800
No. Faks : 04-730 9832
Laman Web : www.moe.gov.my/jpnkedah

Ruj Kami : JPK(BS)-07/03/212 Jld 13 (89)
Tarikh : 27 Oktober 2014

Rosnah binti Yunus
DPP Tradewinds
Universiti Utara Malaysia
06010 Sintok
Kedah Darul Aman

Tuan/Puan,

Kebenaran Untuk Menjalankan Kajian/ Soal Selidik di Jabatan Pendidikan Negeri / Pejabat Pendidikan Daerah dan Sekolah – Sekolah di Negeri Kedah Darulaman

Saya dengan hormatnya diarah merujuk kepada perkara tersebut di atas.

2. Dimaklumkan bahawa permohonan tuan/puan untuk menjalankan kajian yang bertajuk "The Adoption Of Student Information System in Kedah (SIS)" telah **diluluskan**.

3. Kelulusan ini adalah berdasarkan kepada apa yang terkandung di dalam cadangan penyelidikan yang tuan/puan kemukakan itu. Kementerian Pendidikan Malaysia Tuan/Puan dikehendaki mengemukakan senaskah laporan akhir kajian setelah selesai kelak dan dinyatakan supaya mendapat kebenaran terlebih dahulu daripada Jabatan ini sekiranya sebahagian atau seperlunya dapatan kajian tersebut hendak dibentangkan di mana-mana forum, seminar atau diumumkan kepada media.

4. Kebenaran ini adalah tertakluk kepada persetujuan Pengetua sekolah berkenaan dan adalah **sah sehingga 30 Jun 2015 sahaja**.

Sekian, terima kasih.

" BERKHIDMAT UNTUK NEGARA "
" PENDIDIKAN CEMERLANG KEDAH TERBILANG "

Saya yang menurut perintah,

(SABRI BIN OSMAN)
Pembantu Pengarah Kanan (Ketua Unit)
Unit Perhubungan dan Pendaftaran

Appendix C

Questionnaire Design

Assalammualaikum dan selamat sejahtera,

Terima kasih kerana sudi mengambil bahagian didalam penyelidikan saya yang bertajuk *"Factors Influencing the adoption of Student Information System in Kedah (SIS)".* Tujuan Kajian ini dijalankan adalah untuk mendapatkan maklumbalas daripada pihak tuan/puan berkaitan dengan penggunaan Sistem Maklumat Pelajar (SMM) dan Aplikasi Pangkalan Data Murid (APDM) di sekolah menengah kawasan Kubang Pasu. Kajian ini telah mendapat kebenaran daripada Bahagian Perancangan dan Penyelidikan Dasar Pendidikan Kementerian Pendidikan Malaysia (Putrajaya), Jabatan Pendidikan Negeri Kedah (JPN), *Awang Had Salleh Graduate School of Arts and Sciences* dan penyelia saya Prof Madya Dr Haslina Mohd. Dengan itu, disertakan juga surat kebenaran kelulusan kajian dan pengumpulan data untuk perhatian tuan/puan. Kerjasama pihak tuan/puan didalam melengkapkan borang soal selidik ini amatlah diharapkan dan didahului dengan ucapan ribuan terima kasih.

Risniah Binti Yunus,
Master of Science (Information Technology),
School of Computing,
UUM College of Arts and Sciences,
Universiti Utara Malaysia.
(014-5687496 / nursyaniabalqish@ymail.com)

Abstract

This study aims to identify the adoption of Student Information System in Kedah especially in Kubang Pasu District. This study seeks to understand the perceptions, readiness, strengths and weaknesses of the SIS for teachers in five secondary schools in Kubang Pasu District. There are fifty teachers involved which is the class teachers randomly selected to be used as the sample of the study. Before any further investigation on the SIS, immediate action on basic issue of the adoption factors that influence the SIS needs to be performed. Therefore, this study aims to identify the factors that may affect the SMM (Sistem Maklumat Murid offline) or known as APDM (Aplikasi Pangkalan Data Murid Online). The study will be conducted at 5 secondary schools in Kubang Pasu District. The respondents of the study are the stakeholders of the SIS: class teachers and the top management of the school. Survey and interview approaches will be conducted in identifying the adoption factors of the SIS and the relationships among factors. The results will contribute to the educational domain, and decision makers of the Ministry of Education for SIS enhancement in the future.

Abstrak

Matlamat utama kajian ini dijalankan adalah untuk mengenalpasti penggunaan Sistem Maklumat Murid di kedah terutamanya dikawasan daerah Kubang Pasu. Tujuan utama kajian ini dijalankan adalah untuk memahami persepsi, kesediaan, kelebihan dan kekurangan Sistem Maklumat Murid di lima buah sekolah menengah sekitar daerah Kubang Pasu. Terdapat 50 orang guru yang terlibat dan dipilih secara rawak untk dijadikan sampel kajian. Sebelum sebarang kajian dijalankan ke atas Sistem Maklumat Murid, kajian perlu dilakukan terhadap isu penggunaan Sistem Maklumat Murid. Oleh itu, matlamat kajian ini adalah untuk mengenalpasti faktor-faktor yang member kesan kepada Sistem Maklumat Murid (SMM) secara offline atau dikenali sebagai Aplikasi Pangkalan data Murid (APDM) secara online. Kajian ini akan dilaksanakan pada lima buah sekolah sekitar daerah Kubang Pasu. Responden kajian adalah pihak yang berkepentingan terhadap Sistem Maklumat Murid : guru kelas dan pihak atasan sekolah. Kaedah *Survey* dan *Interview* akan dijalankan untuk mengenal pasti penggunaan faktor-faktor dalam Sistem Maklumat Pelajar dan hubungan di antara faktor. Keputusan akan menyumbang kepada matlamat pendidikan dan pembuat keputusan Kementerian Pendidikan untuk penambahbaikan Sistem Maklumat Murid dimasa akan datang.

SECTION A:
QUESTIONNAIRE
CONSUMER BACKGROUND & INITIAL INVESTIGATION
Please (√) in the appropriate answer

1. *School Name* (Nama Sekolah) :
……

2. *Is it a rural school* (Sekolah Luar Bandar)?: [ ] *Is it a urban school*(Sekolah Dalam bandar)?: [ ]

3. *Gender*(Jantina) : *Male* (Lelaki) [ ] *Female* (wanita) [ ]

4. Age (umur):

[ ] 21-30 *Years Old* (Tahun)
[ ] 31-40 *Years Old* (Tahun)
[ ] 41-50 *Years Old* (Tahun)
[ ] 51-60 *Years Oldabove*(Tahun)

5. *Race* (Bangsa):
[ ] *Malay* (Melayu)
[ ] *Chinese* (Cina)
[ ] *Indian* (India)
[ ] *Others, Please specify* (Lain-lain) , Sila nyatakan …….

6. *Marital status teacher*(Status Perkahwinan):
[ ] *Single* (Belum berkahwin)
[ ] *Married* (Berkahwin)
[ ] *Others* (Lain-lain)

7. *Which class do you currently teach* (Guru kelas tingkatan)?:
[ ] *form 1* (ting. 1) [ ] *form 2* (ting. 2)
[ ] *form 3* (ting. 3) [ ] *form 4* (ting. 4)
[ ] *form 5* (ting. 5) [ ] *form 6* (ting. 6)

8. *How long you been using SMM*
(Berapa lama anda menggunakan SMM?):
[ ] Not applicable (tidak pernah)
[ ] < 1 *year* (Tahun)
[ ] 1 – 2 *years* (Tahun)
[ ] 3 – 4 *years* (Tahun)
[ ] 5 – 6 *years above*(Tahun)

9. *How long you been using APDM*
(Berapa lama anda menggunakan APDM?):
[ ] < *1 year* (Tahun)
[ ] 1 – 2 *years* (Tahun)
[ ] 3 – 4 *years* (Tahun)
[ ] 5 – 6 *years* (Tahun)

10. *How long be a class teacher* (Berapa lama anda menjadi
[ ] < 1 *year* (Tahun)
[ ] 2 – 4 *years* (Tahun)
[ ] 5 – 7 *years* (Tahun)
[ ] 8 – 10 *years* (Tahun)
[ ] > 11 *years* (Tahun)

11. *Have you attended any technology related to courses / workshop* (pernah menghadiri sebarang kursus mengenai technology – SMM atau APDM)?
Yes (Ya) [ ] *No*(tidak)[ ]

APLIKASI PANGKALAN DATA MURID (APDM)

SECTION B: PERCEIVED USEFULNESS AND PERCEIVED EASE OF USE TOWARD APDM USAGE, USER SATISFACTION TO THE STUDENT INFORMATION SYSTEM, SCREEN, TERMINOLOGY AND STUDENT INFORMATION SYSTEM, LEARNING, AND STUDENT INFORMATION SYSTEM CAPABILITIES

SEKSYEN B : MANFAAT DAN TAHAP KEMUDAHAN PENGGUNAAN TERHADAP PENGGUNAAN APDM, KEPUASAN PENGGUNA KEPADA SISTEM MAKLUMAT PELAJAR, SKRIN, PERISTILAHAN DAN SISTEM MAKLUMAT PELAJAR, BELAJAR, DAN KEUPAYAAN SISTEM MAKLUMAT PELAJAR

Please rate the extent which you agree with each statement below (Sila beri penilaian berdasarkan setiap pilihan pernyataan yang anda persetujui dibawah)

Please circle the most appropriate option for each statement below (Sila bulatkan jawapan yang sesuai berdasarkan setiap pilihan pernyataan dibawah)

1: Strongly Disagree **2: Disagree** **3: Moderately** **4: Agree** **5: Strongly Agree**					
B1: PERCEIVED USEFULNESS ABOUT THE APDM USAGE:					
1. Using APDM enables me to accomplish task more quickly	1	2	3	4	5
2. Using APDM enhances the quality of my work	1	2	3	4	5
3. Using APDM make it easier to do my work	1	2	3	4	5
4. I find the APDM useful in my work	1	2	3	4	5
5. Using APDM in my job would increase my productivity	1	2	3	4	5
6. Using APDM would improve my job performance	1	2	3	4	5
B2: PERCEIVED EASE OF USE ABOUT THE APDM USAGE:					
1. Learning to use APDM is easy	1	2	3	4	5
2. I find it easy to use APDM to do what I want to do	1	2	3	4	5
3. I find it is easy for me to become skillful in using APDM	1	2	3	4	5
4. I find the APDM is easy to use	1	2	3	4	5
B3: USER SATISFACTIONTO THE STUDENT INFORMATION SYSTEM:					
1.The APDM prototype is very useful	1	2	3	4	5
2.The APDM prototype system is easy to use	1	2	3	4	5
3.I am very satisfied with the APDM prototype system	1	2	3	4	5
4.The APDM prototype system has adequate processing power	1	2	3	4	5
5.The APDM prototype system is stimulating	1	2	3	4	5
6.The APDM prototype system is flexible	1	2	3	4	5
B4: SCREEN:					
1. Screen layouts were always helpful	1	2	3	4	5
2. The amounts of information that can be displayed on the screen are adequate	1	2	3	4	5
3. The arrangement of information that can be displayed on the screen is logical	1	2	3	4	5
4.The arrangement of information that can be displayed on the screens are very clear	1	2	3	4	5
5.The next screen in a sequence are predictable	1	2	3	4	5
6.Going back to the previous screen is possible	1	2	3	4	5
7.The progression of work related task is clearly marked	1	2	3	4	5
B5: TERMINOLOGY AND STUDENT INFORMATION SYSTEM:					
1. The used of terms throughout APDM are consistence	1	2	3	4	5
2.The work related terminology is consistent	1	2	3	4	5
3. Computer Terminology used in the system is consistent	1	2	3	4	5
4.Terminology always relates well to the work you are doing	1	2	3	4	5
5. Computer Terminology is used appropriately	1	2	3	4	5
6. Terminology is on screen precise	1	2	3	4	5

7. Message which appear on the screen is consistent	1	2	3	4	5
8. Position of instructions in the screen is consistent	1	2	3	4	5
9. Prompt for input is clear	1	2	3	4	5
10. Instruction for commands or functions is clear	1	2	3	4	5
11. Instruction for correcting errors is clear	1	2	3	4	5
12. Computer always keeps you informed about what is doing	1	2	3	4	5
13. Controlling amount of feedback is easy	1	2	3	4	5
14. Length of delay between operations is acceptable	1	2	3	4	5
15. Error messages prompt out on the screen is helpful	1	2	3	4	5
16. Error Messages are always clarify problem	1	2	3	4	5
17. Phrasing of error messages is pleasant	1	2	3	4	5
B6: LEARNING:					
1. Learning to operate in the APDM is easy	1	2	3	4	5
2. Getting started the APDM is easy	1	2	3	4	5
3. Time to learn to use the system is fast	1	2	3	4	5
4. Tasks can always be performed in a straight forward manner	1	2	3	4	5
5. Number of steps per task is not too many or just right	1	2	3	4	5
6. Step to complete a task always follows a logical sequence	1	2	3	4	5
7. Feedback on the completion of sequence of steps is clear	1	2	3	4	5
B7: STUDENT INFORMATION SYSTEM CAPABILITIES:					
1. APDM speed is fast enough	1	2	3	4	5
2. Response time for the most operations is fast enough	1	2	3	4	5
3. Rate information is displayed is fast enough	1	2	3	4	5
4. The APDM is always reliable	1	2	3	4	5
5. System failure seldom occurred	1	2	3	4	5
6. The system always warns you about potential problem	1	2	3	4	5

SECTION C:

IF YOU HAVE ANY SUGGESTION OR ADDITIONAL COMMENTS YOU WISH TO MAKE ABOUT APDM USAGE PLEASE ADD THEM HERE.

……
……
……
……
……
……
……
……
……

Thanks For Your Cooperation. You Give Me Your Time, The Most Thoughtful Gift Of All.
I Can No Other Answer Make But,
Thanks,
And Thanks,
And Ever Thanks.

Appendix D

Skewness and Kurtosis of the Variables

Descriptives

			Statistic	Std. Error
School Name	Mean		2.8182	.11273
	95% Confidence Interval for Mean	Lower Bound	2.5948	
		Upper Bound	3.0416	
	5% Trimmed Mean		2.7980	
	Median		3.0000	
	Variance		1.398	
	Std. Deviation		1.18230	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		2.00	
	Skewness		.021	.230
	Kurtosis		-1.138	.457
(PU01) Accomplish task more quickly	Mean		3.4455	.08126
	95% Confidence Interval for Mean	Lower Bound	3.2844	
		Upper Bound	3.6065	
	5% Trimmed Mean		3.4697	
	Median		4.0000	
	Variance		.726	
	Std. Deviation		.85226	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.732	.230
	Kurtosis		.533	.457

(PU02) Enhances the quality of work	Mean		3.3909	.07972
	95% Confidence Interval for Mean	Lower Bound	3.2329	
		Upper Bound	3.5489	
	5% Trimmed Mean		3.4343	
	Median		4.0000	
	Variance		.699	
	Std. Deviation		.83606	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.846	.230
	Kurtosis		.394	.457
(PU03) Make job easier	Mean		3.3636	.08037
	95% Confidence Interval for Mean	Lower Bound	3.2043	
		Upper Bound	3.5229	
	5% Trimmed Mean		3.3939	
	Median		3.5000	
	Variance		.711	
	Std. Deviation		.84297	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.683	.230
	Kurtosis		.300	.457
(PU04) Make useful work	Mean		3.4909	.07829
	95% Confidence Interval for Mean	Lower Bound	3.3357	
		Upper Bound	3.6461	
	5% Trimmed Mean		3.5455	
	Median		4.0000	
	Variance		.674	
	Std. Deviation		.82111	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-1.135	.230
	Kurtosis		.997	.457
(PU05) Increase productivity	Mean		3.3909	.07866
	95% Confidence Interval for Mean	Lower Bound	3.2350	
		Upper Bound	3.5468	
	5% Trimmed Mean		3.4242	
	Median		4.0000	
	Variance		.681	
	Std. Deviation		.82502	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.742	.230
	Kurtosis		.056	.457

(PU06) Improve job performance	Mean		3.3364	.07779
	95% Confidence Interval for Mean	Lower Bound	3.1822	
		Upper Bound	3.4905	
	5% Trimmed Mean		3.3535	
	Median		3.0000	
	Variance		.666	
	Std. Deviation		.81587	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.489	.230
	Kurtosis		.078	.457
(PEOU01) Easy to learn	Mean		3.4909	.07161
	95% Confidence Interval for Mean	Lower Bound	3.3490	
		Upper Bound	3.6328	
	5% Trimmed Mean		3.5556	
	Median		4.0000	
	Variance		.564	
	Std. Deviation		.75109	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-1.226	.230
	Kurtosis		1.845	.457
(PEOU02) Clear and understandable	Mean		3.3273	.07761
	95% Confidence Interval for Mean	Lower Bound	3.1735	
		Upper Bound	3.4811	
	5% Trimmed Mean		3.3838	
	Median		3.5000	
	Variance		.663	
	Std. Deviation		.81397	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.880	.230
	Kurtosis		.245	.457
(PEOU03) Easy to become skillful	Mean		3.4000	.07877
	95% Confidence Interval for Mean	Lower Bound	3.2439	
		Upper Bound	3.5561	
	5% Trimmed Mean		3.4444	
	Median		4.0000	
	Variance		.683	
	Std. Deviation		.82618	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.867	.230
	Kurtosis		.525	.457

(PEOU04) Easy to use	Mean		3.4727	.07499
	95% Confidence Interval for Mean	Lower Bound	3.3241	
		Upper Bound	3.6213	
	5% Trimmed Mean		3.5152	
	Median		4.0000	
	Variance		.619	
	Std. Deviation		.78646	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.946	.230
	Kurtosis		.696	.457
(US01) US01-Prototype is very useful	Mean		3.3636	.07501
	95% Confidence Interval for Mean	Lower Bound	3.2150	
		Upper Bound	3.5123	
	5% Trimmed Mean		3.4141	
	Median		3.0000	
	Variance		.619	
	Std. Deviation		.78667	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.861	.230
	Kurtosis		.759	.457
(US02) Prototype is easy to use	Mean		3.3909	.07430
	95% Confidence Interval for Mean	Lower Bound	3.2436	
		Upper Bound	3.5382	
	5% Trimmed Mean		3.4545	
	Median		4.0000	
	Variance		.607	
	Std. Deviation		.77927	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-1.050	.230
	Kurtosis		.883	.457
(US03) Satisfied with prototype system	Mean		3.3273	.07761
	95% Confidence Interval for Mean	Lower Bound	3.1735	
		Upper Bound	3.4811	
	5% Trimmed Mean		3.3838	
	Median		3.0000	
	Variance		.663	
	Std. Deviation		.81397	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.880	.230
	Kurtosis		.775	.457

(US04) Prototype has adequate power	Mean		3.3091	.07935
	95% Confidence Interval for Mean	Lower Bound	3.1518	
		Upper Bound	3.4664	
	5% Trimmed Mean		3.3535	
	Median		3.0000	
	Variance		.693	
	Std. Deviation		.83221	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.734	.230
	Kurtosis		.102	.457
(US05) Prototype system is simulating	Mean		3.3455	.07468
	95% Confidence Interval for Mean	Lower Bound	3.1974	
		Upper Bound	3.4935	
	5% Trimmed Mean		3.3939	
	Median		3.0000	
	Variance		.614	
	Std. Deviation		.78327	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.814	.230
	Kurtosis		.737	.457
(US06) Prototype system is flexible	Mean		3.3545	.08228
	95% Confidence Interval for Mean	Lower Bound	3.1915	
		Upper Bound	3.5176	
	5% Trimmed Mean		3.3838	
	Median		3.0000	
	Variance		.745	
	Std. Deviation		.86296	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.672	.230
	Kurtosis		.510	.457
(S01) Screen layout very helpful	Mean		3.4909	.07391
	95% Confidence Interval for Mean	Lower Bound	3.3444	
		Upper Bound	3.6374	
	5% Trimmed Mean		3.5051	
	Median		4.0000	
	Variance		.601	
	Std. Deviation		.77513	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.631	.230
	Kurtosis		.264	.457

(S02) The of information on screen are adequate	Mean		3.3909	.07866
	95% Confidence Interval for Mean	Lower Bound	3.2350	
		Upper Bound	3.5468	
	5% Trimmed Mean		3.4040	
	Median		3.5000	
	Variance		.681	
	Std. Deviation		.82502	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.542	.230
	Kurtosis		.166	.457
(S03) The of information on screen is logical	Mean		3.5091	.07391
	95% Confidence Interval for Mean	Lower Bound	3.3626	
		Upper Bound	3.6556	
	5% Trimmed Mean		3.5253	
	Median		4.0000	
	Variance		.601	
	Std. Deviation		.77513	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.693	.230
	Kurtosis		.328	.457
(S04) The information on screen are very clear	Mean		3.6182	.06325
	95% Confidence Interval for Mean	Lower Bound	3.4928	
		Upper Bound	3.7435	
	5% Trimmed Mean		3.6667	
	Median		4.0000	
	Variance		.440	
	Std. Deviation		.66335	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-1.118	.230
	Kurtosis		1.839	.457
(S05) Sequences on next screen are predictable	Mean		3.4818	.07160
	95% Confidence Interval for Mean	Lower Bound	3.3399	
		Upper Bound	3.6237	
	5% Trimmed Mean		3.5253	
	Median		4.0000	
	Variance		.564	
	Std. Deviation		.75092	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.930	.230
	Kurtosis		.351	.457

(S06) Sequences on previous screen are possible	Mean		3.5182	.06801
	95% Confidence Interval for Mean	Lower Bound	3.3834	
		Upper Bound	3.6530	
	5% Trimmed Mean		3.5657	
	Median		4.0000	
	Variance		.509	
	Std. Deviation		.71333	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.992	.230
	Kurtosis		.793	.457
(S07) The progression of work clearly marked	Mean		3.4727	.07609
	95% Confidence Interval for Mean	Lower Bound	3.3219	
		Upper Bound	3.6235	
	5% Trimmed Mean		3.4899	
	Median		4.0000	
	Variance		.637	
	Std. Deviation		.79804	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.626	.230
	Kurtosis		.640	.457
(T01) The used of terms are consistent	Mean		3.4818	.07160
	95% Confidence Interval for Mean	Lower Bound	3.3399	
		Upper Bound	3.6237	
	5% Trimmed Mean		3.5354	
	Median		4.0000	
	Variance		.564	
	Std. Deviation		.75092	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-1.062	.230
	Kurtosis		1.069	.457
(T02) Terminology is consistent	Mean		3.4545	.06911
	95% Confidence Interval for Mean	Lower Bound	3.3176	
		Upper Bound	3.5915	
	5% Trimmed Mean		3.4949	
	Median		4.0000	
	Variance		.525	
	Std. Deviation		.72487	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.796	.230
	Kurtosis		1.244	.457

(T03) Computer terminology is consistent	Mean		3.5091	.07044
	95% Confidence Interval for Mean	Lower Bound	3.3695	
		Upper Bound	3.6487	
	5% Trimmed Mean		3.5455	
	Median		4.0000	
	Variance		.546	
	Std. Deviation		.73877	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.866	.230
	Kurtosis		1.348	.457
(T04) Clear and understandable terminology	Mean		3.5000	.07277
	95% Confidence Interval for Mean	Lower Bound	3.3558	
		Upper Bound	3.6442	
	5% Trimmed Mean		3.5455	
	Median		4.0000	
	Variance		.583	
	Std. Deviation		.76326	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-1.009	.230
	Kurtosis		1.739	.457

(T05) Computer terminology is used appropriately	Mean		3.5182	.06801
	95% Confidence Interval for Mean	Lower Bound	3.3834	
		Upper Bound	3.6530	
	5% Trimmed Mean		3.5758	
	Median		4.0000	
	Variance		.509	
	Std. Deviation		.71333	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-1.146	.230
	Kurtosis		1.708	.457
(T06) Terminology is on screen precise	Mean		3.4727	.06420
	95% Confidence Interval for Mean	Lower Bound	3.3455	
		Upper Bound	3.6000	
	5% Trimmed Mean		3.5152	
	Median		4.0000	
	Variance		.453	
	Std. Deviation		.67333	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.726	.230
	Kurtosis		.833	.457

(T07) Consistent message on screen	Mean		3.4818	.06678
	95% Confidence Interval for Mean	Lower Bound	3.3495	
		Upper Bound	3.6142	
	5% Trimmed Mean		3.5253	
	Median		4.0000	
	Variance		.490	
	Std. Deviation		.70035	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.832	.230
	Kurtosis		.685	.457
(T08) Position of instructions is consistent	Mean		3.5545	.06404
	95% Confidence Interval for Mean	Lower Bound	3.4276	
		Upper Bound	3.6815	
	5% Trimmed Mean		3.5960	
	Median		4.0000	
	Variance		.451	
	Std. Deviation		.67166	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.850	.230
	Kurtosis		1.251	.457
(T09) Prompt for input is clear	Mean		3.4273	.07358
	95% Confidence Interval for Mean	Lower Bound	3.2814	
		Upper Bound	3.5731	
	5% Trimmed Mean		3.4545	
	Median		4.0000	
	Variance		.596	
	Std. Deviation		.77174	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.667	.230
	Kurtosis		.038	.457
(T10) Instruction for commands is clear	Mean		3.6273	.06309
	95% Confidence Interval for Mean	Lower Bound	3.5022	
		Upper Bound	3.7523	
	5% Trimmed Mean		3.6616	
	Median		4.0000	
	Variance		.438	
	Std. Deviation		.66165	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.966	.230
	Kurtosis		1.794	.457

(T11) Instruction for correcting errors is clear	Mean		3.5273	.06920
	95% Confidence Interval for Mean	Lower Bound	3.3901	
		Upper Bound	3.6644	
	5% Trimmed Mean		3.5758	
	Median		4.0000	
	Variance		.527	
	Std. Deviation		.72579	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-1.050	.230
	Kurtosis		1.607	.457
(T12) Computer always informed about what is doing	Mean		3.4636	.07383
	95% Confidence Interval for Mean	Lower Bound	3.3173	
		Upper Bound	3.6100	
	5% Trimmed Mean		3.5152	
	Median		4.0000	
	Variance		.600	
	Std. Deviation		.77433	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-1.024	.230
	Kurtosis		1.390	.457
(T13) Controlling of feedback is easy	Mean		3.3818	.06953
	95% Confidence Interval for Mean	Lower Bound	3.2440	
		Upper Bound	3.5196	
	5% Trimmed Mean		3.4242	
	Median		3.0000	
	Variance		.532	
	Std. Deviation		.72923	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.735	.230
	Kurtosis		.877	.457
(T14) Length of delay is acceptable	Mean		3.3182	.08161
	95% Confidence Interval for Mean	Lower Bound	3.1564	
		Upper Bound	3.4799	
	5% Trimmed Mean		3.3535	
	Median		3.0000	
	Variance		.733	
	Std. Deviation		.85598	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.667	.230
	Kurtosis		-.008	.457

(T15) Error messages prompt is helpful	Mean		3.3091	.07613
	95% Confidence Interval for Mean	Lower Bound	3.1582	
		Upper Bound	3.4600	
	5% Trimmed Mean		3.3636	
	Median		3.0000	
	Variance		.638	
	Std. Deviation		.79846	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.839	.230
	Kurtosis		.342	.457
(T16) Error messages always clarify problem	Mean		3.3273	.07973
	95% Confidence Interval for Mean	Lower Bound	3.1693	
		Upper Bound	3.4853	
	5% Trimmed Mean		3.3333	
	Median		3.0000	
	Variance		.699	
	Std. Deviation		.83621	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.395	.230
	Kurtosis		-.030	.457
(T17) Phrasing of error messages is pleasant	Mean		3.3727	.07734
	95% Confidence Interval for Mean	Lower Bound	3.2194	
		Upper Bound	3.5260	
	5% Trimmed Mean		3.3838	
	Median		3.0000	
	Variance		.658	
	Std. Deviation		.81115	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.471	.230
	Kurtosis		.256	.457
(L01) Learning is easy	Mean		3.5455	.06911
	95% Confidence Interval for Mean	Lower Bound	3.4085	
		Upper Bound	3.6824	
	5% Trimmed Mean		3.5960	
	Median		4.0000	
	Variance		.525	
	Std. Deviation		.72487	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-1.118	.230
	Kurtosis		.899	.457

(L02) Getting started is easy	Mean		3.5455	.06666
	95% Confidence Interval for Mean	Lower Bound	3.4133	
		Upper Bound	3.6776	
	5% Trimmed Mean		3.5960	
	Median		4.0000	
	Variance		.489	
	Std. Deviation		.69910	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-1.067	.230
	Kurtosis		1.067	.457
(L03) Time to learn is fast	Mean		3.4455	.07259
	95% Confidence Interval for Mean	Lower Bound	3.3016	
		Upper Bound	3.5893	
	5% Trimmed Mean		3.4747	
	Median		4.0000	
	Variance		.580	
	Std. Deviation		.76129	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.702	.230
	Kurtosis		.163	.457
(L04) Task performed in straight forward manner	Mean		3.4091	.06748
	95% Confidence Interval for Mean	Lower Bound	3.2754	
		Upper Bound	3.5428	
	5% Trimmed Mean		3.4242	
	Median		3.0000	
	Variance		.501	
	Std. Deviation		.70770	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.304	.230
	Kurtosis		.547	.457
(L05) Number of steps is just right	Mean		3.3364	.07779
	95% Confidence Interval for Mean	Lower Bound	3.1822	
		Upper Bound	3.4905	
	5% Trimmed Mean		3.3636	
	Median		3.0000	
	Variance		.666	
	Std. Deviation		.81587	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.592	.230
	Kurtosis		-.008	.457

(L06) Complete task is logical sequence	Mean		3.4182	.07119
	95% Confidence Interval for Mean	Lower Bound	3.2771	
		Upper Bound	3.5593	
	5% Trimmed Mean		3.4646	
	Median		4.0000	
	Variance		.557	
	Std. Deviation		.74664	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.859	.230
	Kurtosis		.812	.457
(L07) Feedback of completion is clear	Mean		3.4364	.07366
	95% Confidence Interval for Mean	Lower Bound	3.2904	
		Upper Bound	3.5824	
	5% Trimmed Mean		3.4646	
	Median		4.0000	
	Variance		.597	
	Std. Deviation		.77255	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.695	.230
	Kurtosis		.060	.457
(C01) Fast enough	Mean		2.9636	.09914
	95% Confidence Interval for Mean	Lower Bound	2.7671	
		Upper Bound	3.1601	
	5% Trimmed Mean		2.9646	
	Median		3.0000	
	Variance		1.081	
	Std. Deviation		1.03982	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		2.00	
	Skewness		-.226	.230
	Kurtosis		-.554	.457
(C02) Response time is fast enough	Mean		2.9818	.09489
	95% Confidence Interval for Mean	Lower Bound	2.7937	
		Upper Bound	3.1699	
	5% Trimmed Mean		2.9949	
	Median		3.0000	
	Variance		.990	
	Std. Deviation		.99523	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		2.00	
	Skewness		-.304	.230
	Kurtosis		-.383	.457

(C03) Rate displayed is fast enough	Mean		3.1091	.09164
	95% Confidence Interval for Mean	Lower Bound	2.9275	
		Upper Bound	3.2907	
	5% Trimmed Mean		3.1263	
	Median		3.0000	
	Variance		.924	
	Std. Deviation		.96113	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		2.00	
	Skewness		-.285	.230
	Kurtosis		-.374	.457
(C04) Reliable	Mean		3.2909	.08601
	95% Confidence Interval for Mean	Lower Bound	3.1204	
		Upper Bound	3.4614	
	5% Trimmed Mean		3.3131	
	Median		3.0000	
	Variance		.814	
	Std. Deviation		.90204	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.536	.230
	Kurtosis		-.373	.457
(C05) System failure seldom occured	Mean		3.0909	.09362
	95% Confidence Interval for Mean	Lower Bound	2.9054	
		Upper Bound	3.2765	
	5% Trimmed Mean		3.1364	
	Median		3.0000	
	Variance		.964	
	Std. Deviation		.98190	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.659	.230
	Kurtosis		-.279	.457
(C06) System always warns about potential problem	Mean		3.1091	.08792
	95% Confidence Interval for Mean	Lower Bound	2.9348	
		Upper Bound	3.2834	
	5% Trimmed Mean		3.1465	
	Median		3.0000	
	Variance		.850	
	Std. Deviation		.92216	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.506	.230
	Kurtosis		-.056	.457

(rsOus) Rural or Urban School	Mean		1.0096	.00962
	95% Confidence Interval for Mean	Lower Bound	.9905	
		Upper Bound	1.0287	
	5% Trimmed Mean		1.0000	
	Median		1.0000	
	Variance		.010	
	Std. Deviation		.09806	
	Minimum		1.00	
	Maximum		2.00	
	Range		1.00	
	Interquartile Range		.00	
	Skewness		10.198	.237
	Kurtosis		104.000	.469
Gender	Mean		1.7745	.04158
	95% Confidence Interval for Mean	Lower Bound	1.6920	
		Upper Bound	1.8570	
	5% Trimmed Mean		1.8050	
	Median		2.0000	
	Variance		.176	
	Std. Deviation		.41997	
	Minimum		1.00	
	Maximum		2.00	
	Range		1.00	
	Interquartile Range		.00	
	Skewness		-1.333	.239
	Kurtosis		-.227	.474
Age	Mean		2.7182	.07321
	95% Confidence Interval for Mean	Lower Bound	2.5731	
		Upper Bound	2.8633	
	5% Trimmed Mean		2.7374	
	Median		3.0000	
	Variance		.590	
	Std. Deviation		.76784	
	Minimum		1.00	
	Maximum		4.00	
	Range		3.00	
	Interquartile Range		1.00	
	Skewness		-.087	.230
	Kurtosis		-.381	.457
Race	Mean		1.0364	.02867
	95% Confidence Interval for Mean	Lower Bound	.9795	
		Upper Bound	1.0932	
	5% Trimmed Mean		1.0000	
	Median		1.0000	
	Variance		.090	
	Std. Deviation		.30068	
	Minimum		1.00	
	Maximum		4.00	
	Range		3.00	
	Interquartile Range		.00	
	Skewness		9.253	.230

Marital Status	Mean		1.9909	.02415
	95% Confidence Interval for Mean	Lower Bound	1.9431	
		Upper Bound	2.0388	
	5% Trimmed Mean		2.0000	
	Median		2.0000	
	Variance		.064	
	Std. Deviation		.25325	
	Minimum		1.00	
	Maximum		3.00	
	Range		2.00	
	Interquartile Range		.00	
	Skewness		-.466	.230
	Kurtosis		13.334	.457
(CTeacher) Class Teachers	Mean		3.2222	.17743
	95% Confidence Interval for Mean	Lower Bound	2.8691	
		Upper Bound	3.5753	
	5% Trimmed Mean		3.1914	
	Median		3.0000	
	Variance		2.550	
	Std. Deviation		1.59687	
	Minimum		1.00	
	Maximum		6.00	
	Range		5.00	
	Interquartile Range		3.00	
	Skewness		.249	.267
	Kurtosis		-1.091	.529
(Usmm) Using SMM	Mean		3.7041	.10175
	95% Confidence Interval for Mean	Lower Bound	3.5021	
		Upper Bound	3.9060	
	5% Trimmed Mean		3.7721	
	Median		4.0000	
	Variance		1.015	
	Std. Deviation		1.00728	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.670	.244
	Kurtosis		.373	.483
(Uapdm) Using APDM	Mean		2.6023	.08932
	95% Confidence Interval for Mean	Lower Bound	2.4247	
		Upper Bound	2.7798	
	5% Trimmed Mean		2.6136	
	Median		3.0000	
	Variance		.702	
	Std. Deviation		.83789	
	Minimum		1.00	
	Maximum		4.00	
	Range		3.00	
	Interquartile Range		1.00	
	Skewness		-.092	.257
	Kurtosis		-.520	.508

(BeenCT) Been Class Teacher	Mean		3.7500	.13295
	95% Confidence Interval for Mean	Lower Bound	3.4864	
		Upper Bound	4.0136	
	5% Trimmed Mean		3.8333	
	Median		4.0000	
	Variance		1.909	
	Std. Deviation		1.38162	
	Minimum		1.00	
	Maximum		5.00	
	Range		4.00	
	Interquartile Range		2.00	
	Skewness		-.686	.233
	Kurtosis		-.927	.461
(Workshop) Attended Workshop	Mean		1.5714	.04853
	95% Confidence Interval for Mean	Lower Bound	1.4752	
		Upper Bound	1.6677	
	5% Trimmed Mean		1.5794	
	Median		2.0000	
	Variance		.247	
	Std. Deviation		.49725	
	Minimum		1.00	
	Maximum		2.00	
	Range		1.00	
	Interquartile Range		1.00	
	Skewness		-.293	.236
	Kurtosis		-1.952	.467

Appendix E

Correlation Matrix

	PU01	PU02	PU03	PU05	PU06	PEOU2	PEOU3	PEOU4	US01	US03	US04	US05	US06	S01	S02	S03	S05	S06	S07
PU01	1.000	.874	.832	.794	.812	.727	.722	.641	.659	.687	.697	.702	.656	.610	.533	.542	.536	.537	.659
PU02	.874	1.000	.903	.801	.868	.727	.715	.595	.619	.660	.616	.674	.595	.636	.561	.525	.545	.565	.683
PU03	.832	.903	1.000	.770	.848	.761	.711	.610	.629	.627	.610	.669	.590	.679	.546	.585	.532	.523	.669
PU05	.794	.801	.770	1.000	.907	.696	.751	.674	.684	.750	.718	.783	.680	.701	.650	.633	.597	.619	.748
PU06	.812	.868	.848	.907	1.000	.744	.751	.622	.622	.717	.737	.764	.624	.665	.607	.612	.542	.596	.740
PEOU2	.727	.727	.761	.696	.744	1.000	.854	.716	.557	.668	.621	.627	.565	.674	.464	.606	.490	.527	.692
PEOU3	.722	.715	.711	.751	.751	.854	1.000	.794	.649	.731	.659	.663	.623	.736	.522	.553	.559	.626	.754
PEOU4	.641	.595	.610	.674	.622	.716	.794	1.000	.683	.731	.728	.671	.670	.835	.702	.760	.683	.737	.752
US01	.659	.619	.629	.684	.622	.557	.649	.683	1.000	.801	.696	.732	.727	.743	.613	.657	.570	.626	.703
US03	.687	.660	.627	.750	.717	.668	.731	.731	.801	1.000	.852	.857	.813	.732	.641	.693	.625	.637	.777
US04	.697	.616	.610	.718	.737	.621	.659	.728	.696	.852	1.000	.876	.779	.687	.651	.650	.552	.593	.690
US05	.702	.674	.669	.783	.764	.627	.663	.671	.732	.857	.876	1.000	.835	.731	.726	.690	.635	.629	.764
US06	.656	.595	.590	.680	.624	.565	.623	.670	.727	.813	.779	.835	1.000	.725	.667	.633	.541	.519	.687
S01	.610	.636	.679	.701	.665	.674	.736	.835	.743	.732	.687	.731	.725	1.000	.744	.817	.741	.764	.778
S02	.533	.561	.546	.650	.607	.464	.522	.702	.613	.641	.651	.726	.667	.744	1.000	.819	.671	.682	.692
S03	.542	.525	.585	.633	.612	.606	.553	.760	.657	.693	.650	.690	.633	.817	.819	1.000	.725	.763	.749
S05	.536	.545	.532	.597	.542	.490	.559	.683	.570	.625	.552	.635	.541	.741	.671	.725	1.000	.797	.719
S06	.537	.565	.523	.619	.596	.527	.626	.737	.626	.637	.593	.629	.519	.764	.682	.763	.797	1.000	.758
S07	.659	.683	.669	.748	.740	.692	.754	.752	.703	.777	.690	.764	.687	.778	.692	.749	.719	.758	1.000
T06	.685	.647	.664	.606	.626	.719	.712	.770	.556	.703	.703	.644	.577	.659	.639	.695	.598	.631	.673
T07	.698	.725	.695	.671	.725	.751	.774	.765	.662	.751	.671	.681	.626	.760	.655	.761	.688	.763	.820
T09	.615	.677	.647	.600	.658	.710	.679	.707	.543	.608	.550	.543	.514	.658	.629	.707	.576	.711	.682
T13	.565	.550	.563	.512	.553	.607	.643	.722	.619	.715	.620	.618	.628	.655	.634	.708	.633	.674	.649
T14	.672	.696	.703	.602	.660	.758	.739	.688	.603	.718	.646	.628	.653	.647	.524	.611	.530	.599	.758
T15	.645	.697	.690	.637	.670	.662	.701	.686	.667	.704	.587	.649	.598	.686	.567	.588	.683	.683	.791
T16	.643	.603	.650	.611	.631	.663	.672	.711	.543	.677	.605	.596	.575	.642	.531	.632	.609	.651	.728
T17	.673	.635	.645	.589	.613	.689	.720	.785	.576	.703	.657	.619	.648	.699	.644	.673	.621	.662	.788
L03	.667	.618	.646	.626	.643	.651	.633	.702	.508	.606	.664	.617	.595	.683	.597	.669	.616	.652	.632

L04	.562	.565	.579	.462	.490	.578	.596	.688	.620	.625	.547	.603	.617	.751	.635	.687	.662	.667	.662
L05	.640	.653	.621	.634	.655	.648	.656	.708	.580	.662	.575	.635	.572	.737	.648	.728	.751	.722	.768
L06	.699	.662	.645	.685	.656	.663	.693	.754	.676	.754	.661	.692	.679	.768	.656	.738	.734	.744	.820
L07	.524	.515	.501	.579	.551	.529	.586	.699	.582	.632	.545	.552	.536	.696	.666	.759	.757	.751	.719
C01	.505	.534	.591	.423	.523	.589	.530	.481	.420	.491	.522	.534	.515	.500	.498	.467	.422	.372	.552
C02	.572	.604	.631	.489	.539	.653	.623	.503	.548	.562	.483	.561	.606	.606	.512	.500	.466	.401	.577
C03	.623	.609	.641	.547	.631	.693	.649	.587	.578	.658	.657	.705	.672	.629	.594	.590	.511	.519	.686
C04	.665	.724	.692	.659	.701	.706	.680	.606	.651	.706	.649	.687	.668	.686	.573	.626	.563	.576	.725
C05	.543	.571	.547	.386	.488	.571	.475	.443	.456	.536	.515	.508	.590	.483	.454	.505	.351	.364	.530
C06	.475	.420	.491	.414	.439	.526	.496	.510	.501	.575	.506	.506	.550	.502	.498	.563	.493	.401	.615

	T06	T07	T09	T13	T14	T15	T16	T17	L03	L04	L05	L06	L07	C01	C02	C03	C04	C05	C06
PU01	.685	.698	.615	.565	.672	.645	.643	.673	.667	.562	.640	.699	.524	.505	.572	.623	.665	.543	.475
PU02	.647	.725	.677	.550	.696	.697	.603	.635	.618	.565	.653	.662	.515	.534	.604	.609	.724	.571	.420
PU03	.664	.695	.647	.563	.703	.690	.650	.645	.646	.579	.621	.645	.501	.591	.631	.641	.692	.547	.491
PU05	.606	.671	.600	.512	.602	.637	.611	.589	.626	.462	.634	.685	.579	.423	.489	.547	.659	.386	.414
PU06	.626	.725	.658	.553	.660	.670	.631	.613	.643	.490	.655	.656	.551	.523	.539	.631	.701	.488	.439
PEOU2	.719	.751	.710	.607	.758	.662	.663	.689	.651	.578	.648	.663	.529	.589	.653	.693	.706	.571	.526
PEOU3	.712	.774	.679	.643	.739	.701	.672	.720	.633	.596	.656	.693	.586	.530	.623	.649	.680	.475	.496
PEOU4	.770	.765	.707	.722	.688	.686	.711	.785	.702	.688	.708	.754	.699	.481	.503	.587	.606	.443	.510
US01	.556	.662	.543	.619	.603	.667	.543	.576	.508	.620	.580	.676	.582	.420	.548	.578	.651	.456	.501
US03	.703	.751	.608	.715	.718	.704	.677	.703	.606	.625	.662	.754	.632	.491	.562	.658	.706	.536	.575
US04	.703	.671	.550	.620	.646	.587	.605	.657	.664	.547	.575	.661	.545	.522	.483	.657	.649	.515	.506
US05	.644	.681	.543	.618	.628	.649	.596	.619	.617	.603	.635	.692	.552	.534	.561	.705	.687	.508	.506
US06	.577	.626	.514	.628	.653	.598	.575	.648	.595	.617	.572	.679	.536	.515	.606	.672	.668	.590	.550
S01	.659	.760	.658	.655	.647	.686	.642	.699	.683	.751	.737	.768	.696	.500	.606	.629	.686	.483	.502
S02	.639	.655	.629	.634	.524	.567	.531	.644	.597	.635	.648	.656	.666	.498	.512	.594	.573	.454	.498
S03	.695	.761	.707	.708	.611	.588	.632	.673	.669	.687	.728	.738	.759	.467	.500	.590	.626	.505	.563
S05	.598	.688	.576	.633	.530	.683	.609	.621	.616	.662	.751	.734	.757	.422	.466	.511	.563	.351	.493
S06	.631	.763	.711	.674	.599	.683	.651	.662	.652	.667	.722	.744	.751	.372	.401	.519	.576	.364	.401
S07	.673	.820	.682	.649	.758	.791	.728	.788	.632	.662	.768	.820	.719	.552	.577	.686	.725	.530	.615
T06	1.000	.816	.738	.694	.739	.613	.700	.783	.713	.649	.677	.680	.570	.575	.519	.628	.617	.531	.522
T07	.816	1.000	.838	.732	.767	.716	.715	.779	.712	.709	.757	.769	.676	.528	.566	.671	.720	.563	.500
T09	.738	.838	1.000	.751	.751	.692	.720	.769	.735	.685	.731	.674	.700	.511	.536	.604	.756	.554	.475
T13	.694	.732	.751	1.000	.744	.678	.681	.719	.682	.743	.754	.715	.744	.527	.528	.595	.652	.476	.524
T14	.739	.767	.751	.744	1.000	.727	.763	.805	.653	.646	.699	.737	.607	.601	.621	.660	.806	.653	.595
T15	.613	.716	.692	.678	.727	1.000	.781	.798	.632	.667	.726	.751	.716	.566	.584	.661	.740	.526	.577
T16	.700	.715	.720	.681	.763	.781	1.000	.874	.706	.640	.657	.734	.643	.562	.558	.629	.700	.544	.596

T17	.783	.779	.769	.719	.805	.798	.874	1.000	.754	.755	.724	.801	.690	.604	.622	.712	.753	.602	.620
L03	.713	.712	.735	.682	.653	.632	.706	.754	1.000	.766	.702	.702	.680	.496	.507	.560	.665	.473	.427
L04	.649	.709	.685	.743	.646	.667	.640	.755	.766	1.000	.729	.767	.728	.519	.584	.608	.703	.527	.521
L05	.677	.757	.731	.754	.699	.726	.657	.724	.702	.729	1.000	.806	.798	.534	.561	.631	.714	.500	.512
L06	.680	.769	.674	.715	.737	.751	.734	.801	.702	.767	.806	1.000	.826	.433	.541	.601	.717	.473	.506
L07	.570	.676	.700	.744	.607	.716	.643	.690	.680	.728	.798	.826	1.000	.431	.488	.504	.672	.455	.564
C01	.575	.528	.511	.527	.601	.566	.562	.604	.496	.519	.534	.433	.431	1.000	.850	.849	.667	.740	.750
C02	.519	.566	.536	.528	.621	.584	.558	.622	.507	.584	.561	.541	.488	.850	1.000	.846	.711	.772	.702
C03	.628	.671	.604	.595	.660	.661	.629	.712	.560	.608	.631	.601	.504	.849	.846	1.000	.725	.738	.711
C04	.617	.720	.756	.652	.806	.740	.700	.753	.665	.703	.714	.717	.672	.667	.711	.725	1.000	.695	.634
C05	.531	.563	.554	.476	.653	.526	.544	.602	.473	.527	.500	.473	.455	.740	.772	.738	.695	1.000	.779
C06	.522	.500	.475	.524	.595	.577	.596	.620	.427	.521	.512	.506	.564	.750	.702	.711	.634	.779	1.000

Appendix F

Anti Image Matrices

Anti Image Covariance

	PU01	PU02	PU03	PU05	PU06	PEOU2	PEOU3	PEOU4	US01	US03	US04	US05	US06	S01	S02	S03	S05	S06	S07
PU01	.111	-.036	1.345E-05	-.013	.006	-.009	-.008	.006	-.039	.027	-.013	-.007	-.016	.018	.020	-.002	.000	.005	.022
PU02	-.036	.052	-.036	-.004	-.013	.000	.010	-.012	.017	-.018	.007	.009	.008	.006	-.023	.020	-.013	-.015	-.011
PU03	1.345E-05	-.036	.081	.004	-.016	-.003	.000	.014	-.025	.022	.008	-.014	.005	-.025	.024	-.017	.001	.029	.014
PU05	-.013	-.004	.004	.064	-.034	-.007	-.008	-.009	-.018	-.017	.022	-.009	-.020	-.002	-.018	.003	-.008	-.005	-.007
PU06	.006	-.013	-.016	-.034	.061	.001	-.014	.019	.018	.007	-.028	.005	.010	.004	-.001	-.011	.018	.002	-.003
PEOU2	-.009	.000	-.003	-.007	.001	.114	-.046	-.019	.033	-.001	-.002	-.001	.020	.006	.040	-.036	.008	.031	.002
PEOU3	-.008	.010	.000	-.008	-.014	-.046	.090	-.030	.001	-.006	.011	-.003	.006	-.020	-.003	.044	.014	-.020	-.011
PEOU4	.006	-.012	.014	-.009	.019	-.019	-.030	.101	-.023	.016	-.024	.005	-.010	-.028	-.002	-.012	-.005	.005	.008
US01	-.039	.017	-.025	-.018	.018	.033	.001	-.023	.158	-.027	-.023	.023	-.006	.004	-.003	-.015	.037	-.025	-.018
US03	.027	-.018	.022	-.017	.007	-.001	-.006	.016	-.027	.084	-.029	-.014	-.015	.001	.026	-.011	.008	.014	.008
US04	-.013	.007	.008	.022	-.028	-.002	.011	-.024	-.023	-.029	.072	-.033	.007	-.017	1.436E-05	.016	-.008	-.001	.007
US05	-.007	.009	-.014	-.009	.005	-.001	-.003	.005	.023	-.014	-.033	.069	-.031	.018	-.029	-.006	-.011	-.010	-.025
US06	-.016	.008	.005	-.020	.010	.020	.006	-.010	-.006	-.015	.007	-.031	.145	-.031	-.007	.011	-.004	.036	.001
S01	.018	.006	-.025	-.002	.004	.006	-.020	-.028	.004	.001	-.017	.018	-.031	.090	-.011	-.026	-.009	-.024	-.002
S02	.020	-.023	.024	-.018	-.001	.040	-.003	-.002	-.003	.026	1.436E-05	-.029	-.007	-.011	.147	-.044	.000	.015	.010
S03	-.002	.020	-.017	.003	-.011	-.036	.044	-.012	-.015	-.011	.016	-.006	.011	-.026	-.044	.077	-.005	-.018	-.013
S05	.000	-.013	.001	-.008	.018	.008	.014	-.005	.037	.008	-.008	-.011	-.004	-.009	.000	-.005	.177	-.056	.008
S06	.005	-.015	.029	-.005	.002	.031	-.020	.005	-.025	.014	-.001	-.010	.036	-.024	.015	-.018	-.056	.149	-.010
S07	.022	-.011	.014	-.007	-.003	.002	-.011	.008	-.018	.008	.007	-.025	.001	-.002	.010	-.013	.008	-.010	.092
T06	-.004	-.004	-.010	-.008	.022	-.006	-.018	-.001	.002	-.014	-.013	-.008	.022	.012	-.013	-.015	-.010	.005	.031
T07	-.009	-.001	.005	.018	-.014	.006	-.019	.006	-.009	-.017	.009	.010	-.002	-.004	.009	-.012	-.034	.003	-.033

T09	.012	-.006	-.001	-.003	-.002	-.021	.013	-.012	.002	.008	.008	.008	.001	.011	-.024	.003	.030	-.031	.009
T13	.000	-.004	-.001	.022	-.005	.007	-.017	-.005	-.010	-.023	.000	-.003	-.031	.026	-.008	-.019	.005	-.005	.031
T14	.008	.005	-.021	.010	.003	-.018	-.005	.001	.004	-.002	-.005	.013	-.022	.009	-.002	.010	.007	-.019	-.032
T15	.017	-.011	-.007	.019	-.009	-.027	.009	.002	-.054	-.013	.028	-.020	.005	-.015	-.002	.034	-.031	-.004	-.009
T16	-.011	.018	-.010	-.009	-.011	.009	.009	-.009	.012	-.014	.018	-.015	.019	-.005	.033	-.004	-.011	-.019	.012
T17	-.014	.005	-.003	.003	.005	.018	-.005	-.019	.032	-.004	-.013	.025	-.008	.013	-.025	-.001	.011	.007	-.024
L03	-.016	.015	-.014	-.027	.007	-.009	.007	.011	.037	.020	-.040	.014	-.020	.009	.016	-.008	-.001	-.012	.004
L04	.006	-.010	.002	.034	-.005	-.009	.002	.002	-.040	-.006	.036	-.027	.005	-.032	-.007	.017	-.004	-.001	.006
L05	-.022	.001	.018	.003	-.016	.005	.012	-.008	.007	-.008	.028	-.008	.026	-.028	.013	.005	-.040	.023	-.021
L06	-.016	9.284E-05	-.005	-.005	.006	-.018	.018	.002	.007	-.004	-.006	.004	-.013	.000	.000	.004	.006	-.011	-.015
L07	.001	.009	.000	-.009	.000	.022	-.018	-.007	.021	.002	-.015	.021	.007	.020	-.008	-.021	-.014	-.010	-.003
C01	.009	.003	-.011	-.004	-.002	.006	.017	-.018	.029	.018	-.019	.012	.005	.010	-.012	.011	.014	-.006	-.017
C02	.003	-.007	.003	.004	.005	-.011	-.021	.017	-.037	-.014	.028	-.008	.004	-.023	-.007	.006	-.029	.022	.012
C03	-.007	.011	-.002	.008	-.008	-.019	.000	.011	8.856E-05	.006	-.009	-.014	-.014	.009	-.001	-.003	.012	-.026	.005
C04	.019	-.019	.024	-.014	.005	-.003	-.005	.034	-.030	.012	-.008	-.021	.007	-.018	.029	-.008	-.002	.028	.024
C05	.005	-.032	.023	.017	.001	-.002	.011	.005	.014	.012	-.015	-.001	-.038	.005	.013	-.018	.048	-.014	.019
C06	-.026	.030	-.023	-.004	.002	.000	-.009	-.004	-.004	-.027	.007	.019	.007	.013	-.011	-.005	-.049	.020	-.036

	T06	T07	T09	T13	T14	T15	T16	T17	L03	L04	L05	L06	L07	C01	C02	C03	C04	C05	C06
PU01	-.004	-.009	.012	.000	.008	.017	-.011	-.014	-.016	.006	-.022	-.016	.001	.009	.003	-.007	.019	.005	-.026
PU02	-.004	-.001	-.006	-.004	.005	-.011	.018	.005	.015	-.010	.001	9.284E-05	.009	.003	-.007	.011	-.019	-.032	.030
PU03	-.010	.005	-.001	-.001	-.021	-.007	-.010	-.003	-.014	.002	.018	-.005	.000	-.011	.003	-.002	.024	.023	-.023
PU05	-.008	.018	-.003	.022	.010	.019	-.009	.003	-.027	.034	.003	-.005	-.009	-.004	.004	.008	-.014	.017	-.004
PU06	.022	-.014	-.002	-.005	.003	-.009	-.011	.005	.007	-.005	-.016	.006	.000	-.002	.005	-.008	.005	.001	.002
PEOU2	-.006	.006	-.021	.007	-.018	-.027	.009	.018	-.009	-.009	.005	-.018	.022	.006	-.011	-.019	-.003	-.002	.000
PEOU3	-.018	-.019	.013	-.017	-.005	.009	.009	-.005	.007	.002	.012	.018	-.018	.017	-.021	.000	-.005	.011	-.009
PEOU4	-.001	.006	-.012	-.005	.001	.002	-.009	-.019	.011	.002	-.008	.002	-.007	-.018	.017	.011	.034	.005	-.004
US01	.002	-.009	.002	-.010	.004	-.054	.012	.032	.037	-.040	.007	.007	.021	.029	-.037	8.856E-05	-.030	.014	-.004
US03	-.014	-.017	.008	-.023	-.002	-.013	-.014	-.004	.020	-.006	-.008	-.004	.002	.018	-.014	.006	.012	.012	-.027
US04	-.013	.009	.008	.000	-.005	.028	.018	-.013	-.040	.036	.028	-.006	-.015	-.019	.028	-.009	-.008	-.015	.007
US05	-.008	.010	.008	-.003	.013	-.020	-.015	.025	.014	-.027	-.008	.004	.021	.012	-.008	-.014	-.021	-.001	.019
US06	.022	-.002	.001	-.031	-.022	.005	.019	-.008	-.020	.005	.026	-.013	.007	.005	.004	-.014	.007	-.038	.007
S01	.012	-.004	.011	.026	.009	-.015	-.005	.013	.009	-.032	-.028	.000	.020	.010	-.023	.009	-.018	.005	.013
S02	-.013	.009	-.024	-.008	-.002	-.002	.033	-.025	.016	-.007	.013	.000	-.008	-.012	-.007	-.001	.029	.013	-.011
S03	-.015	-.012	.003	-.019	.010	.034	-.004	-.001	-.008	.017	.005	.004	-.021	.011	.006	-.003	-.008	-.018	-.005
S05	-.010	-.034	.030	.005	.007	-.031	-.011	.011	-.001	-.004	-.040	.006	-.014	.014	-.029	.012	-.002	.048	-.049
S06	.005	.003	-.031	-.005	-.019	-.004	-.019	.007	-.012	-.001	.023	-.011	-.010	-.006	.022	-.026	.028	-.014	.020
S07	.031	-.033	.009	.031	-.032	-.009	.012	-.024	.004	.006	-.021	-.015	-.003	-.017	.012	.005	.024	.019	-.036
T06	.139	-.035	-.012	.017	-.023	.014	.008	-.022	-.006	-.004	-.021	-.005	.014	-.036	.021	.014	.030	.002	-.006
T07	-.035	.095	-.039	-.004	.008	.009	.003	.006	-.006	.001	.015	-.009	.010	-.003	.012	-.012	-.002	-.022	.030

T09	-.012	-.039	.118	-.027	.000	.000	-.013	-.006	-.017	.006	-.008	.028	-.017	.021	-.003	-.009	-.039	-.002	.003
T13	.017	-.004	-.027	.146	-.048	-.002	-.014	.006	.003	-.026	-.038	.010	-.025	-.022	.001	.004	.027	.038	-.005
T14	-.023	.008	.000	-.048	.126	.005	-.011	-.003	.003	.021	-.008	-.018	.022	.003	.001	.020	-.047	-.026	.007
T15	.014	.009	.000	-.002	.005	.134	-.023	-.030	-.011	.029	.002	.009	-.040	-.018	.031	-.012	.002	-.005	.004
T16	.008	.003	-.013	-.014	-.011	-.023	.145	-.044	-.015	.017	.023	-.014	.014	-.015	.001	.016	.003	-.011	-.009
T17	-.022	.006	-.006	.006	-.003	-.030	-.044	.064	-.008	-.022	.002	-.011	.015	.020	-.013	-.019	-.020	.004	.002
L03	-.006	-.006	-.017	.003	.003	-.011	-.015	-.008	.165	-.073	-.019	.023	-.011	-1.099E-05	-.019	.021	.008	.001	.025
L04	-.004	.001	.006	-.026	.021	.029	.017	-.022	-.073	.130	.009	-.025	-.013	-.010	.019	.000	-.018	-.005	-.011
L05	-.021	.015	-.008	-.038	-.008	.002	.023	.002	-.019	.009	.161	-.018	-.022	-.011	.016	-.024	-.009	-.018	.024
L06	-.005	-.009	.028	.010	-.018	.009	-.014	-.011	.023	-.025	-.018	.101	-.048	.022	-.013	-.007	-.001	.014	.016
L07	.014	.010	-.017	-.025	.022	-.040	.014	.015	-.011	-.013	-.022	-.048	.103	.006	-.013	.020	-.020	-.009	-.021
C01	-.036	-.003	.021	-.022	.003	-.018	-.015	.020	-1.099E-05	-.010	-.011	.022	.006	.101	-.051	-.033	-.025	.008	-.031
C02	.021	.012	-.003	.001	.001	.031	.001	-.013	-.019	.019	.016	-.013	-.013	-.051	.093	-.030	.006	-.036	.017
C03	.014	-.012	-.009	.004	.020	-.012	.016	-.019	.021	.000	-.024	-.007	.020	-.033	-.030	.104	.004	.001	-.010
C04	.030	-.002	-.039	.027	-.047	.002	.003	-.020	.008	-.018	-.009	-.001	-.020	-.025	.006	.004	.117	.003	-.013
C05	.002	-.022	-.002	.038	-.026	-.005	-.011	.004	.001	-.005	-.018	.014	-.009	.008	-.036	.001	.003	.132	-.077
C06	-.006	.030	.003	-.005	.007	.004	-.009	.002	.025	-.011	.024	.016	-.021	-.031	.017	-.010	-.013	-.077	.144

Anti Image Correlation

	PU01	PU02	PU03	PU05	PU06	PEOU2	PEOU3	PEOU4	US01	US03	US04	US05	US06	S01	S02	S03	S05	S06	S07
PU01	.951[a]	-.469	.000	-.152	.072	-.078	-.076	.061	-.298	.279	-.151	-.074	-.126	.178	.153	-.026	-.002	.042	.214
PU02	-.469	.911[a]	-.556	-.072	-.228	-.003	.153	-.172	.189	-.270	.111	.143	.086	.089	-.260	.318	-.131	-.174	-.161
PU03	.000	-.556	.934[a]	.054	-.223	-.036	-.005	.151	-.222	.265	.105	-.189	.044	-.288	.223	-.218	.006	.260	.161
PU05	-.152	-.072	.054	.932[a]	-.541	-.082	-.104	-.115	-.183	-.228	.324	-.137	-.209	-.021	-.182	.046	-.075	-.054	-.096
PU06	.072	-.228	-.223	-.541	.943[a]	.010	-.184	.243	.186	.104	-.424	.079	.111	.056	-.013	-.156	.179	.024	-.045
PEOU2	-.078	-.003	-.036	-.082	.010	.945[a]	-.451	-.181	.243	-.010	-.021	-.013	.158	.060	.307	-.388	.057	.237	.020
PEOU3	-.076	.153	-.005	-.104	-.184	-.451	.938[a]	-.311	.008	-.070	.131	-.044	.049	-.219	-.027	.528	.111	-.175	-.127
PEOU4	.061	-.172	.151	-.115	.243	-.181	-.311	.956[a]	-.180	.178	-.278	.066	-.085	-.298	-.019	-.138	-.036	.037	.083
US01	-.298	.189	-.222	-.183	.186	.243	.008	-.180	.921[a]	-.236	-.220	.221	-.041	.037	-.018	-.134	.219	-.161	-.149
US03	.279	-.270	.265	-.228	.104	-.010	-.070	.178	-.236	.946[a]	-.379	-.183	-.139	.012	.237	-.133	.067	.124	.090
US04	-.151	.111	.105	.324	-.424	-.021	.131	-.278	-.220	-.379	.900[a]	-.469	.069	-.207	.000	.217	-.070	-.012	.093
US05	-.074	.143	-.189	-.137	.079	-.013	-.044	.066	.221	-.183	-.469	.926[a]	-.307	.226	-.291	-.080	-.102	-.100	-.310
US06	-.126	.086	.044	-.209	.111	.158	.049	-.085	-.041	-.139	.069	-.307	.957[a]	-.272	-.045	.100	-.025	.244	.011
S01	.178	.089	-.288	-.021	.056	.060	-.219	-.298	.037	.012	-.207	.226	-.272	.945[a]	-.098	-.316	-.069	-.205	-.026
S02	.153	-.260	.223	-.182	-.013	.307	-.027	-.019	-.018	.237	.000	-.291	-.045	-.098	.941[a]	-.409	-.002	.101	.084
S03	-.026	.318	-.218	.046	-.156	-.388	.528	-.138	-.134	-.133	.217	-.080	.100	-.316	-.409	.921[a]	-.044	-.165	-.154
S05	-.002	-.131	.006	-.075	.179	.057	.111	-.036	.219	.067	-.070	-.102	-.025	-.069	-.002	-.044	.947[a]	-.344	.060
S06	.042	-.174	.260	-.054	.024	.237	-.175	.037	-.161	.124	-.012	-.100	.244	-.205	.101	-.165	-.344	.949[a]	-.086
S07	.214	-.161	.161	-.096	-.045	.020	-.127	.083	-.149	.090	.093	-.310	.011	-.026	.084	-.154	.060	-.086	.945[a]
T06	-.034	-.048	-.095	-.083	.240	-.049	-.162	-.005	.013	-.126	-.126	-.078	.158	.111	-.092	-.145	-.061	.033	.273
T07	-.088	-.014	.062	.230	-.180	.053	-.202	.057	-.075	-.186	.110	.120	-.016	-.039	.074	-.135	-.260	.023	-.352
T09	.103	-.072	-.015	-.038	-.020	-.181	.130	-.114	.013	.083	.082	.086	.004	.103	-.178	.032	.209	-.234	.083
T13	.001	-.041	-.006	.230	-.050	.058	-.152	-.045	-.065	-.206	.005	-.026	-.213	.228	-.051	-.176	.030	-.036	.271

T14	.064	.058	-.213	.111	.032	-.152	-.049	.012	.027	-.016	-.050	.138	-.160	.082	-.014	.098	.047	-.136	-.295
T15	.141	-.136	-.065	.208	-.103	-.217	.087	.016	-.374	-.120	.288	-.209	.034	-.135	-.012	.334	-.201	-.025	-.077
T16	-.089	.209	-.092	-.094	-.117	.067	.078	-.076	.078	-.130	.179	-.147	.130	-.044	.226	-.034	-.069	-.128	.108
T17	-.162	.090	-.048	.046	.086	.209	-.070	-.243	.317	-.056	-.190	.386	-.086	.171	-.260	-.015	.105	.076	-.319
L03	-.116	.160	-.122	-.261	.068	-.065	.058	.082	.227	.174	-.371	.128	-.131	.077	.106	-.069	-.003	-.075	.036
L04	.052	-.119	.015	.371	-.052	-.072	.014	.016	-.276	-.053	.373	-.290	.039	-.296	-.050	.166	-.029	-.011	.057
L05	-.164	.008	.160	.031	-.159	.035	.096	-.066	.047	-.069	.264	-.079	.172	-.233	.085	.041	-.236	.148	-.173
L06	-.150	.001	-.060	-.058	.079	-.168	.186	.019	.057	-.048	-.068	.052	-.109	-.001	.002	.044	.046	-.091	-.161
L07	.005	.127	.003	-.112	.003	.201	-.187	-.072	.161	.016	-.178	.250	.058	.208	-.066	-.239	-.107	-.084	-.029
C01	.086	.037	-.122	-.048	-.026	.060	.181	-.178	.229	.190	-.224	.149	.041	.102	-.101	.125	.108	-.048	-.180
C02	.025	-.102	.030	.052	.065	-.108	-.229	.180	-.303	-.153	.348	-.094	.032	-.246	-.063	.069	-.226	.183	.130
C03	-.064	.150	-.025	.103	-.094	-.173	.003	.107	.001	.060	-.107	-.169	-.116	.094	-.007	-.028	.092	-.209	.056
C04	.163	-.248	.246	-.166	.054	-.023	-.045	.313	-.221	.120	-.089	-.233	.054	-.172	.221	-.085	-.014	.215	.236
C05	.044	-.382	.222	.186	.010	-.016	.098	.046	.094	.111	-.159	-.008	-.276	.041	.095	-.183	.313	-.096	.175
C06	-.208	.343	-.215	-.043	.021	-.002	-.080	-.032	-.025	-.244	.067	.187	.047	.110	-.075	-.043	-.305	.133	-.311

	T06	T07	T09	T13	T14	T15	T16	T17	L03	L04	L05	L06	L07	C01	C02	C03	C04	C05	C06
PU01	-.034	-.088	.103	.001	.064	.141	-.089	-.162	-.116	.052	-.164	-.150	.005	.086	.025	-.064	.163	.044	-.208
PU02	-.048	-.014	-.072	-.041	.058	-.136	.209	.090	.160	-.119	.008	.001	.127	.037	-.102	.150	-.248	-.382	.343
PU03	-.095	.062	-.015	-.006	-.213	-.065	-.092	-.048	-.122	.015	.160	-.060	.003	-.122	.030	-.025	.246	.222	-.215
PU05	-.083	.230	-.038	.230	.111	.208	-.094	.046	-.261	.371	.031	-.058	-.112	-.048	.052	.103	-.166	.186	-.043
PU06	.240	-.180	-.020	-.050	.032	-.103	-.117	.086	.068	-.052	-.159	.079	.003	-.026	.065	-.094	.054	.010	.021
PEOU2	-.049	.053	-.181	.058	-.152	-.217	.067	.209	-.065	-.072	.035	-.168	.201	.060	-.108	-.173	-.023	-.016	-.002
PEOU3	-.162	-.202	.130	-.152	-.049	.087	.078	-.070	.058	.014	.096	.186	-.187	.181	-.229	.003	-.045	.098	-.080
PEOU4	-.005	.057	-.114	-.045	.012	.016	-.076	-.243	.082	.016	-.066	.019	-.072	-.178	.180	.107	.313	.046	-.032
US01	.013	-.075	.013	-.065	.027	-.374	.078	.317	.227	-.276	.047	.057	.161	.229	-.303	.001	-.221	.094	-.025
US03	-.126	-.186	.083	-.206	-.016	-.120	-.130	-.056	.174	-.053	-.069	-.048	.016	.190	-.153	.060	.120	.111	-.244
US04	-.126	.110	.082	.005	-.050	.288	.179	-.190	-.371	.373	.264	-.068	-.178	-.224	.348	-.107	-.089	-.159	.067
US05	-.078	.120	.086	-.026	.138	-.209	-.147	.386	.128	-.290	-.079	.052	.250	.149	-.094	-.169	-.233	-.008	.187
US06	.158	-.016	.004	-.213	-.160	.034	.130	-.086	-.131	.039	.172	-.109	.058	.041	.032	-.116	.054	-.276	.047
S01	.111	-.039	.103	.228	.082	-.135	-.044	.171	.077	-.296	-.233	-.001	.208	.102	-.246	.094	-.172	.041	.110
S02	-.092	.074	-.178	-.051	-.014	-.012	.226	-.260	.106	-.050	.085	.002	-.066	-.101	-.063	-.007	.221	.095	-.075
S03	-.145	-.135	.032	-.176	.098	.334	-.034	-.015	-.069	.166	.041	.044	-.239	.125	.069	-.028	-.085	-.183	-.043
S05	-.061	-.260	.209	.030	.047	-.201	-.069	.105	-.003	-.029	-.236	.046	-.107	.108	-.226	.092	-.014	.313	-.305
S06	.033	.023	-.234	-.036	-.136	-.025	-.128	.076	-.075	-.011	.148	-.091	-.084	-.048	.183	-.209	.215	-.096	.133
S07	.273	-.352	.083	.271	-.295	-.077	.108	-.319	.036	.057	-.173	-.161	-.029	-.180	.130	.056	.236	.175	-.311
T06	.956[a]	-.305	-.097	.117	-.177	.100	.060	-.238	-.041	-.029	-.139	-.045	.116	-.307	.182	.116	.232	.014	-.043
T07	-.305	.957[a]	-.365	-.030	.077	.076	.024	.071	-.044	.006	.124	-.092	.104	-.029	.123	-.125	-.017	-.192	.257
T09	-.097	-.365	.957[a]	-.205	.001	-.002	-.098	-.064	-.123	.051	-.058	.258	-.158	.190	-.029	-.080	-.335	-.015	.020
T13	.117	-.030	-.205	.949[a]	-.352	-.016	-.098	.064	.019	-.189	-.250	.085	-.200	-.181	.010	.036	.207	.273	-.032

T14	-.177	.077	.001	-.352	.958[a]	.036	-.079	-.032	.019	.167	-.058	-.158	.192	.025	.005	.173	-.388	-.199	.055
T15	.100	.076	-.002	-.016	.036	.941[a]	-.162	-.327	-.073	.217	.016	.079	-.341	-.153	.281	-.101	.013	-.041	.032
T16	.060	.024	-.098	-.098	-.079	-.162	.961[a]	-.454	-.100	.124	.147	-.120	.112	-.120	.012	.129	.021	-.078	-.064
T17	-.238	.071	-.064	.064	-.032	-.327	-.454	.930[a]	-.075	-.237	.017	-.141	.190	.245	-.165	-.229	-.233	.040	.023
L03	-.041	-.044	-.123	.019	.019	-.073	-.100	-.075	.948[a]	-.496	-.114	.181	-.087	-8.495E-05	-.156	.157	.057	.006	.160
L04	-.029	.006	.051	-.189	.167	.217	.124	-.237	-.496	.929[a]	.060	-.219	-.112	-.090	.176	-.004	-.149	-.039	-.082
L05	-.139	.124	-.058	-.250	-.058	.016	.147	.017	-.114	.060	.962[a]	-.144	-.175	-.082	.127	-.183	-.067	-.120	.157
L06	-.045	-.092	.258	.085	-.158	.079	-.120	-.141	.181	-.219	-.144	.960[a]	-.475	.218	-.134	-.072	-.013	.120	.137
L07	.116	.104	-.158	-.200	.192	-.341	.112	.190	-.087	-.112	-.175	-.475	.934[a]	.054	-.135	.191	-.184	-.079	-.169
C01	-.307	-.029	.190	-.181	.025	-.153	-.120	.245	-8.495E-05	-.090	-.082	.218	.054	.907[a]	-.530	-.322	-.232	.070	-.254
C02	.182	.123	-.029	.010	.005	.281	.012	-.165	-.156	.176	.127	-.134	-.135	-.530	.909[a]	-.302	.053	-.320	.148
C03	.116	-.125	-.080	.036	.173	-.101	.129	-.229	.157	-.004	-.183	-.072	.191	-.322	-.302	.959[a]	.034	.008	-.080
C04	.232	-.017	-.335	.207	-.388	.013	.021	-.233	.057	-.149	-.067	-.013	-.184	-.232	.053	.034	.938[a]	.021	-.098
C05	.014	-.192	-.015	.273	-.199	-.041	-.078	.040	.006	-.039	-.120	.120	-.079	.070	-.320	.008	.021	.905[a]	-.555
C06	-.043	.257	.020	-.032	.055	.032	-.064	.023	.160	-.082	.157	.137	-.169	-.254	.148	-.080	-.098	-.555	.907[a]

Appendix G
Scatter Plot Graph