UNIVERSITI PUTRA MALAYSIA

INVESTIGATING THE INFLUENCE OF EXTERNAL VARIABLES AND MEDIATORS ON LEARNING MANAGEMENT SYSTEM UTILIZATION AMONG EDUCATION STUDENTS OF THREE MALAYSIAN RESEARCH UNIVERSITES

SOUSAN BALEGHI ZADEH

FPP 2014 44

INVESTIGATING THE INFLUENCE OF EXTERNAL VARIABLES AND MEDIATORS ON LEARNING MANAGEMENT SYSTEM UTILIZATION AMONG EDUCATION STUDENTS OF THREE MALAYSIAN RESEARCH UNIVERSITES

By

SOUSAN BALEGHI ZADEH

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

May 2014

DEDICATION

Dedicated to my mother for her true love,

overwhelming support and enormous sacrifice

And to the memory of my late father

Abstract of Thesis Presented to the Senate of Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

INVESTIGATING THE INFLUENCE OF EXTERNAL VARIABLES AND MEDIATORS ON LEARNING MANAGEMENT SYSTEM UTILIZATION AMONG EDUCATION STUDENTS OF THREE MALAYSIAN RESEARCH UNIVERSITIES

By

SOUSAN BALEGHI ZADEH

May 2014

Chairman: Associate Prof. Ahmad Fauzi bin Mohd Ayub, PhD
Faculty: Educational Studies

Recently, in the context of higher education, the use of learning management systems involving the application of Information and Communication Technologies has become widespread. Despite the advantages of learning management systems in enhancing the quality of learning, it is not fully utilized by students. Review of the related studies shows that although there is an enormous amount of research on online tools, only a few of them have investigated how students use the online tools found within LMS.

The main purpose of the present study is to investigate the influence of external factors and mediators on Learning Management Systems utilization among full-time undergraduate students of faculties of education at Universiti Putra Malaysia (UPM), Universiti Kebangsaan Malaysia (UKM) and Universiti Malaya (UM) based on Technology Acceptance Model, Theory of Reasoned Action, and Fit Model. By reviewing the related literature, the influence of nine factors on LMS utilization (task-technology fit, subjective norm, technical support, system interactivity, system functionality, Internet experience, perceived ease of use, perceived usefulness, and behavior intention to use) were examined.

The present study was entirely quantitative with a descriptive design. The main instrument used was a questionnaire whose content validity was checked by a panel of experts. A pilot study was conducted on 40 students of UPM and UM to assess the reliability of the instrument. The value of Cronbach's alpha was from .75 to .95. The sampling technique was stratified and the sample size was 400. To analyze the data, descriptive statistics and the Structural Equation Modeling technique were used.

After testing the measurement model, the construct of Internet experience was removed, and as a result, nine predictors of LMS use remained. The outcome of testing the structural model revealed that among the 16 paths of the structural model, 12 paths were significant and four were not. The 12 significant paths were: 1) task-technology fit influences LMS use (β=.212, $p<.01$); 2) task-technology fit influences perceived usefulness (β=.334, $p<.001$); 3) subjective norm influences perceived usefulness (β=.200, .001); 4) subjective norm influences behavior intention to use

(β=.158, p<.05); 5) system functionality influences perceived usefulness (β = .222, p<.001; 6) system functionality influences perceived ease of use (β= .221, p<.01); 7); technical support influences perceived ease of use (β=.197, p<.001); 8) system interactivity influences perceived usefulness (.126, p<.05); 9); perceived ease of use influences perceived usefulness (β=.123, p<.05); 10) perceived ease of use influences behavior intention to use (β=.232, p<.001); 11) perceived usefulness influences behavior intention to use (β= .324, p<.001); and 12) behavior intention to use influences LMS use (β=.479, p<.001).

The findings of the study revealed that the influence of technical support on perceived usefulness (β= .003, p>.05), the influence of system interactivity on perceived ease of use (β= -.046, p>.05), the influence of perceived usefulness on LMS use (β=.015, p>.05), and the influence of perceived ease of use on LMS use (β = -.084, p>.05) were not significant. After testing the structural model, two new significant paths emerged: 1) the influence of task-technology fit on perceived ease of use (β=.248, p<.001) and 2) the influence of subjective norm on perceived ease of use (β=.200, p<.01).

The results of mediation tests indicated that behavior intention to use indirectly mediated the influence of perceived ease of use on LMS use and fully mediated the influence of perceived usefulness on LMS use. Perceived usefulness partially mediated the influence of perceived ease of use on behavior intention to use and partially mediated the influence of subjective norm on behavior intention to use. Perceived ease of use indirectly mediated the influence of technical support on perceived usefulness, partially mediated the influence of system functionality on perceived usefulness, partially mediated the influence of task-technology fit on perceived usefulness, and partially mediated the influence of subjective norm on perceived usefulness. The proposed structural model explained 42.8% of perceived ease of use, 65.9% of perceived usefulness, 37.6% of behavior intention to use, and 32.1% of LMS use.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

PENYIASATAN PENGARUH PEMBOLEHUBAH LUARAN DAN PENGANTARAAN TERHADAP PENGGUNAAN SISTEM PENGURUSAN PEMBELAJARAN DALAM KALANGAN PELAJAR PENDIDIKAN DI TIGA BUAH UNIVERSITI PENYELIDIKAN DI MALAYSIA

Oleh

SOUSAN BALEGHI ZADEH

Mei 2014

Pengerusi: Prof. Madya Ahmad Fauzi bin Mohd Ayub, PhD
Fakulti: Pengajian Pendidikan

Akhir-akhir ini, dalam konteks pendidikan pengajian tinggi, penggunaan sistem pengurusan pembelajaran yang melibatkan aplikasi Teknologi Maklumat dan Komunikasi semakin meluas. Walaupun sistem pengurusan pembelajaran mempunyai kebaikan bagi meningkatkan kualiti pembelajaran, ia tidak digunakan sepenuhnya oleh pelajar. Kajian literatur berkaitan menunjukkan walaupun terdapat banyak penyelidikan berkaitan pembelajaran atas talian, namun tidak banyak yang berkaitan dengan pembelajaran atas talian melalui LMS.

Tujuan utama kajian ini adalah untuk peramal yang memberi mempengaruhi penggunaan Sistem Pengurusan Pembelajaran dalam kalangan pelajar sepenuh masa peringkat ijazah di fakulti-fakulti Pendidikan di Universiti Putra Malaysia (UPM), Universiti Kebangsaan Malaysia (UKM) dan Universiti Malaya (UM) berdasarkan Model Penerimaan Teknologi, Teori Tindakan Beralasan dan Model suaian. Berdasarkan literatur yang berkaitan, kesan sembilan faktor (suaian tugas- teknologi, norma subjektif, sokongan teknikal, interaktiviti sistem, fungsian sistem, pengalaman Internet, persepsi kemudahgunaan, persepsi kebergunaan, dan hasrat perlakuan) dikaji ke atas penggunaan LMS.

Kajian ini keseluruhannya kuantitatif dengan reka bentuk deskriptif. Instrumen utama yang digunakan adalah soal selidik yang kesahan kandungnnya disemak oleh panel pakar. Kajian rintis telah dijalankan ke atas 40 pelajar UPM dan UM bagi menilai kebolehpercayaan instrumen. Nilai alfa Cronbach keseluruhan ialah .96. Teknik persampelan yang digunakan adalah persampelan berkelompok dan saiz sampel 400. Bagi menganalisis data, statistik deskriptif dan Pemodelan *Persamaan Berstruktur digunakan.*

Semasa analisis faktor, konstruk pengalaman Internet dikeluarkan dan meninggalkan sembilan peramal. Hasil ujian model struktural menunjukkan daripada 16 laluan model struktural, Dua belas didapati signifikan dan empat tidak signifikan. 12 laluan

yang signifikan adalah: 1) suaian teknologi-tugas memberi pengaruh terhadap persepsi kebergunaan LMS (β=.212, p<.01). 2) suaian teknologi-tugas memberi pengaruh terhadap persepsi kebergunaan (β=.334, p<.001); 3) norma subjektif memberi pengaruh terhadap persepsi kebergunaan (β=.200, .001); 4) norma subjektif memberi pengaruh terhadap hasrat perlakuan (β=.158, p<.05); 5), fungsian sistem memberi pengaruh terhadap persepsi kebergunaan (β = .222, p<.001; 6) fungsian sistem memberi kemudahgunaan (β= .221, p<.01); 7) sokongan teknikal memberi pengaruh terhadap kemudahgunaan (β=.197, p<.001); 8) interaktiviti sistem memberi pengaruh terhadap kebergunaan (.126, p<.01); 9) kemudahgunaan memberi pengaruh terhadap persepsi kebergunaan (β=.123, p<.05); 10) kemudahgunaan memberi pengaruh terhadap hasrat perlakuan (β=.232, p<.001); 11) persepsi kebergunaan memberi pengaruh terhadap hasrat perlakuan (β= .324, p<.001); dan 12) hasrat perlakuan memberi pengaruh terhadap penggunaan LMS (β=.479, p<.001).
Hasil kajian menunjukkan pengaruh sokongan teknikal terhadap persepsi kebergunaan (β= .003, p > .05), pengaruh sistem interaktiviti terhadap persepsi kemudahgunaan (β= -.046, p>.05), pengaruh kebergunaan terhadap penggunaan LMS (β = -.084, p>.05) adalah tidak signifikan. Selepas model struktural diuji, dua laluan baru yang signifikan muncul: 1) pengaruh tugas-teknologi suaian terhadap persepsi kemudahgunaan (β=.248, p<.001) dan 2) pengaruh norma subjektif terhadap persepsi kemudahgunaan (β=.200, p<.01).

Hasil kajian menunjukkan hasrat perlakuan mempunyai pengaruh pengantaraan secara tidak langsung dengan kemudahgunaan LMS dan mempunyai pengaruh pengantaraan sepenuhnya dengan kebergunaan LMS. Persepsi kebergunaan merupakan pengantaraan sebahagian pengaruh kemudahgunaan terhadap hasrat perlakuan dan pengaruh norma subjektif terhadap hasrat perlakuan. Persepsi kemudahgunaan mempunyai pengantaraan secara tidak langsung pengaruh sokongan teknikal terhadap persepsi kebergunaan, pengantaraan sebahagian pengaruh kebolehfungsian system terhadap persepsi kebergunaan, pengantara sebahagian antara tugas-teknologi suaian terhadap persepsi kebergunaan, dan pengantara sebahagian pengaruh norma subjektif dengan persepsi kebergunaan. Pemodelan *Persamaan Berstruktur* yang dicadangkan menerangkan 42.8% persepsi kemudahgunaan , 65.9% persepsi kebergunaan 37.6% hasrat perlakuan, dan 32.1% penggunaan LMS.

ACKNOWLEDGEMENTS

"In the Name of Allah, the Most Compassionate, the Most Merciful"

First of all, I should thank Allah the Almighty for giving me the blessing as well as health and strength to finalize this project. I would not have been able to carry out this research project had it not been for the generous help I received from a number of kind people. I would, therefore, like to express my gratitude to the following people:

I would like to sincerely thank my Dissertation Chair Associate Prof. Dr. Ahmad Fauzi bin Mohd Ayub for his scholarly advice and generous help. He helped me a lot to shape the study and sharpen my arguments throughout this research project. Had it not been for his invaluable support and encouragement, I would not have been able to complete this study. I would like to extend my thanks to my dissertation committee members Dr. Rosnaini Mahmud and Dr. Shaffe Mohd Daud for their constructive comments and invaluable feedback throughout the whole project. I am also grateful to Dr. Mokhtar Hj Nawawi, Head of the Department of Foundation Studies, Faculty of Educational Studies at UPM for his meticulous reading of an earlier draft of my work. His precious comments enormously helped me to improve the quality of my work.

I would like to thank Associate Prof. Dr. Wong Su Luan and Prof. Wan Zah Wan Ali, lecturers of Faculty of Educational Studies at UPM, for taking their precious time to examine the content validity of my questionnaire. I would also like to thank Prof. Fred D. Davis, Prof. Dale L. Goodhue, Dr. Wei-Tsong Wang, Associate Professor Keenan A. Pituch, and Dr. Jane Klobas for their invaluable comments on improving the content validity of my questionnaire. My heartfelt thanks should also go to Prof. Mohamed Amin Embi, Professor of Technology-enhanced learning at UKM, for his patience in explaining the iFolio system to me.

Many thanks are also due to Dr. Rahil binti Mahyuddin, lecturer of Faculty of Educational Studies at UPM, for her accurate translation of my questionnaire into Malay. In this respect, I should also thank Associate Prof. Dr. Seyed Abolgassem Fatemi Jahromi and Assistant Prof. Dr. Mohammad Reza Anani Sarab of Shahid Beheshti University in Tehran, Iran for editing the English version of the questionnaire.

Finally, I should thank Dr. Chin Hai Leng, Head of the Department of Curriculum and Instructional Technology of University Malaya, and Prof. Rohazaini Hasan, Senior Chief Assistant Registrar of Faculty of Education at UKM for their cooperation in the process of data collection. I need to sincerely thank all the students who participated in this research by filling in the questionnaire.

I am particularly grateful to my mother, without whose love and support I would not have reached this stage in my life. Last but not least, I should like to thank my brother Associate Prof. Dr. Sasan Baleghizadeh for editing and proofreading the whole manuscript.

I certify that a Thesis Examination Committee has met on 30 May 2014 to conduct the final examination of Sousan Baleghi Zadeh on her thesis entitled "Investigating the Influence of External Variables and Mediators on Learning Management System Utilization among Education Students of Three Malaysian Research Universities" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

Members of the Thesis Examination Committee were as follows:

Wong Su Luan, PhD
Associate Professor
Faculty of Educational Studies
Universiti Putra Malaysia
(Chairman)

Kamariah binti Abu Bakar, PhD
Professor
Faculty of Educational Studies
Universiti Putra Malaysia
(Internal Examiner)

Bahaman bin Abu Samah, PhD
Professor
Faculty of Educational Studies
Universiti Putra Malaysia
(Internal Examiner)

Timothy Teo, PhD
Professor
University of Macau
China
(External Examiner)

NORITAH OMAR, PhD
Associate Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 21 July 2014

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirements for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

Ahmad Fauzi bin Mohd Ayub, PhD
Associate Professor
Faculty of Educational Studies
Universiti Putra Malaysia
(Chairman)

Rosnaini binti Mahmud
Senior Lecturer
Faculty of Educational Studies
Universiti Putra Malaysia
(Member)

Shaffe bin Mohd Daud
Senior Lecturer
Faculty of Educational Studies
Universiti Putra Malaysia
(Member)

BUJANG BIN KIM HUAT, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

DECLARATION

Declaration by graduate student

I hereby confirm that:

- this thesis is my original work;
- quotations, illustrations and citations have been duly referenced;
- this thesis has not been submitted previously or concurrently for any other degree at any other institutions;
- intellectual property from the thesis and copyright of thesis are fully-owned by Universiti Putra Malaysia, as according to the Universiti Putra Malaysia (Research) Rules 2012;
- written permission must be obtained from supervisor and the office of Deputy Vice-Chancellor (Research and Innovation) before thesis is published (in the form of written, printed or in electronic form) including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules or any other materials as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- there is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld as according to the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software.

Signature:_____ Date: _____

Name and Matric No.: Sousan Baleghi Zadeh / Gs28802

Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

Signature: _____
Name of Chairman of Supervisory Committee: **Associate Professor Dr. Ahmad Fauzi bin Mohd Ayub**

ASSOC. PROF. DR. AHMAD FAUZI BIN MOHD AYU
Department of Foundations of Education
Faculty of Educational Studies
Universiti Putra Malaysia

Signature: _____
Name of Member of Supervisory Committee: **Dr. Rosnaini binti Mahmud**

Signature: _____
Name of Member of Supervisory Committee: **Dr. Shaffe bin Mohd Daud**

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBRIVIATIONS

AGFI	Adjusted Goodness of Fit Index
AIC	Akaike's Information Criterion
AVE	Average Variance Extracted
BI	Behavior Intention to Use
BC	Bias Corrected
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CI	Confidence Interval
CMS	Course Management System
CR	Construct Reliability
EFA	Exploratory Factor Analysis
GFI	Goodness of Fit Index
HKIED	Hong Kong Institution of Education
ICT	Information and Communication Technologies
IE	Internet Experience
IS	Information System
LMS	Learning Management System
LMSU	Learning Management System Use
MTS	Malaysian Teacher Standards
NFI	Normed Fit Index
PAM	Post Acceptance Model
PEU	Perceived Ease of Use
PNFI	Parsimony Normed Fit Index
PU	Perceived Usefulness
RMR	Root Mean Square Residual
RMSEA	Root Mean Squares Error of Approximation
SCORM	Sharable Content Object References Model
SEM	Structural Equation Modeling
SF	System Functionality
SI	System Interactivity
SN	Subjective Norm
SRMR	Standardized Root Mean Squared Residual
TAM	Technology Acceptance Model
TLI	Tucker Lewis Index
TRA	Theory of Reasoned Action
TS	Technical Support
TTF	Task- Technology Fit
UKM	Universiti Kebangsaan Malaysia
UM	Universiti Malaya
UMS	Universiti Malaysia Sabah
USM	Universiti Sains Malaysia
UNPD	United Nations Development Programme
UPM	Universiti Putra Malaysia
UTAUT	Unified Theory of Acceptance and Usage of Technology
UTAUT2	Unified Theory of Acceptance and Usage of Technology 2
UTeM	Universiti Teknikal Malaysia Melaka
UTM	Universiti Teknologi Malaysia
UUM	Universiti Utara Malaysia
VIF	Variance Inflation Factor

CHAPTER ONE
INTRODUCTION

1.1 Background

In recent years, the rapid growth of Information and Communication Technologies (ICT) has affected various aspects of life in general and education in particular. In this era, ICT provides different opportunities for schools and universities in order to improve their educational systems, meet students' needs, and prepare the new generation for the challenges of tomorrow's world (Hernandez, Montaner, Sese, & Urquizu, 2011).

There is a variety of definitions for ICT, which sometimes results in confusion (Brown & Brown, 2008; Detschew, 2007). Some of the definitions are general and include a wide variety of technology, while the others are narrower. For example, the United Nations Development Programme (UNPD) regarded ICT as a variety of goods, applications, and services for producing, storing, processing and distributing information and focused on digital devices (UNDP, 2005). Hill and Wouters (2010) also considered digital devices as ICT. Detschew (2007) regarded ICT as permanent accessibility, availability, and efficiency of computers, phones, and networks.

In general, the role of ICT in education has grown to the extent that today educators consider instructional technology as equipment – particularly electronic equipment (Roblyer & Doering, 2010). Therefore, if schools and universities do not adjust themselves to new technologies, they will fall in vigorous challenges (Coates, James, & Baldwin, 2005). In today's world, a major portion of young people's learning takes place through ICT (Davis, Weigel, & Gardner, 2009). Most young people use social networks (e.g., Facebook, LinkedIn, MySpace), upload homemade videos on sites (YouTube or PetTube), and share their own slides (slide share) to communicate with each other (Davis et al., 2009). Therefore, educational institutions are required to adjust their education to electronic platforms more than before (Folden, 2012; Ozkan, Koseler, & Baykal, 2009).

The role of technology and media in education is not new. Throughout the history of education, researchers have found that using simple media ranging from whiteboard to advanced technologies (e.g., instructional radio or TV programs, audio, video, multimedia) and even robot assistance teachers would enhance students' motivation for further learning (Fridin, 2014). Undoubtedly, technology facilitates the process of learning. For example, visual media such as charts and graphs help students to grasp abstract concepts and perceive the relationship between real-world and the contents of what they study (Chen & Teng, 2011; Smaldino, Lowther, & Russell, 2011). Integrating technology into classroom provides a variety of opportunities that help instructors to lead students to higher order thinking and develop effective collaborative projects (Richardson, 2010; Saadé, Morin, & Thomas, 2012; Smaldino et al., 2011). Nevertheless, an important point that needs consideration is that the growth of technology has reached a stage where it can produce new concepts and terms in the domain of education (e.g., robot learning, ubiquitous learning and web-based learning) that did not exist before (Folden, 2012; Chatzis, Korkinof, & Demiris, 2012; Wagner, Barbosa, & Barbosa, 2014).This requires educators and curriculum planners to integrate new technologies with curriculum more than before.

Integrating ICT into teaching and learning is one of the most important strategies employed by the Malaysian Ministry of Higher Education (Raja Maznah, 2004). Integrating technology into the process of teaching and learning is also regarded as one of the standards of Malaysian Teacher Standards (MTS) (Goh, 2012). Therefore, it is necessary for pre-service teachers to enhance their skills of working with ICT (Teo, Lee, Chai, & Choy, 2009). This means that all Malaysian pre-service teachers need to be exposed to at least one particular ICT course.

ICT assists higher education students to manage knowledge which is especially vital for pre-service teachers (Biasutti & EL-Deghaidy, 2012). Through knowledge management, pre-service teachers will be able to share their resources and experiences and adopt a good practice for further teaching. The result of a case study by Lai and Ng (2011) on pre-service teachers in Hong Kong Institution of Education (HKIED) revealed that using ICT (wiki) in the classroom provided opportunities for students to master peer-learning and peer-assessment, which is good practice for their future teaching. Ng, Yuen, and Leung (2013) investigated the influence of integrating ICT (LMS) in music education among pre-service teachers in Hong Kong and found that in views of pre-service teachers doing online tasks facilitated the process of learning.

One of the popular concepts that ICT has produced in the realm of education is e-learning (Hernandenz et al., 2011; Ŝumak, Heričko, & Pušnik, 2011). For example, Asian governments and some international organizations such as UNESCO and Japan International Cooperation Agency support using ICT and e-learning (Latchem & Jung, 2010). There are numerous definitions offered for e-learning. Some of them are broader and encompass different types of ICT, while the others are narrower. For example, Hill and Wouters (2010) have defined e-learning as the use of ICTs (e.g., Internet, Intranet, CD-Rom, interactive TV, teleconferencing, computer conferencing) to deliver instruction to learners. Clark and Mayer (2011) also consider e-learning as the devices such as computer, mobile, and the Internet which deliver instruction, while O'Mahony (2004) and Chang (2008) state that e-learning refers to any form of instruction delivered just through the Web.

Systems that conduct e-learning are different and have various names such as online systems, virtual systems, learning management systems and so on; however, all of them use Web 2.0 technologies (Baxter, & Hainey, 2012; Piotrowski, 2010). Among these systems, in the last decade, due to the development of the web, the term Web 2.0 was coined (Chatfield, 2009). In fact, Web 2.0 tools are the second generation of web that allow users to create and share their knowledge (Connolly et al., 2012).Web 2.0 tools have a special role in education, because there is an essential difference between this kind of technologies and the other media. Previous digital media such as videos, audio and software could transfer messages unilaterally (Wang, 2004). Despite the fact that some software can give feedback and interact with students, it should be kept in mind that students cannot communicate with each other through them (Saettler, 2004). Nevertheless, through Web 2.0 tools such as wiki, message board and social media, every student can create knowledge and share it with his or her peers as well as instructors at anytime and anywhere in either synchronous or asynchronous environments (Connolly et al., 2012).

Integrating Web 2.0 tools in classroom supports the process of learning. For example, Zakaria, Watson and Edwards (2010) investigated the utilization of Web

2.0 tools among 217 undergraduate students of Universiti Teknikal Malaysia Melaka (UTeM) and found using Web 2.0 tools had a positive influence on students' learning. Sadaf, Newby, and Ertmer (2012) found that pedagogical uses of Web 2.0 tools among 214 pre-service teachers in the United States of America had a positive influence on their intentions to use this technology in the classroom. Valtonen, Hacklin, Kontkanen, Hartikainen-Ahia, Kärkkäinen and Kukkonen (2013) integrated social software into a biology education course among 98 pre-service teachers in Finland. The results of their study revealed that pre-service teachers who used social software made the context of learning more interesting.

1.2 LMS in Higher Education

The advantages of Web 2.0 tools such as weblog and wiki have made the use of the Internet for learning and teaching more common in academic settings (Chatfield, 2009; Richardson, 2010). To benefit from this information system in education, in the last few years many universities and schools across the world have been equipped with a kind of software called learning management system (LMS) which is also referred to as learning platform, portal, content management system, and course management system (Piotrowski, 2010). In the United States of America, the majority of the journals tend to use the terms LMS and course management system (CMS) interchangeably (Piña, 2010). However, in Europe and Asia using virtual learning environment (VLE) is more common. In fact, LMS is a kind of software that needs a server and should benefit from Web 2.0 tools in order to operate (Piña, 2010).

The use of LMS almost started in the early 1990s (Coates et. al., 2005). Today, LMS is one of the most popular software in that its usefulness in higher education institutions is substantially increasing (Álvarez, Martín, Fernández-Castro, & Urretavizcaya, 2013; Dutta, Roy, & Seetharaman, 2013; Islam, 2013). For example, in 2002 nearly one-fifth of college courses in the United States of America used LMS (The 2002 Campus Computing Survey, 2002), while in 2012, 93% of universities were equipped with LMS (The Campus Computing Project, 2012). In Malaysian Public Universities, the developing strategies of equipping with LMS began in 1996 (Puteh, 2007). Today, the LMSs of most of the Malaysian universities are established by their own (Ayub, Tarmizi, Jaafar, Ali, & Luan, 2010; Lee, Chan, Thanimalay, Lim, & 2012). LMS organizes and provides tools through which students will be able to download learning contents, build, and deliver online learning environments (Piña, 2012). One of the most important benefits of LMS is to generate and manage reports on learners and assessment results (Theis, 2005). Besides, through the features of LMS, instructors and students can convey instructional materials, send notice to class, submit assignments, and interact with each other (Lonn & Teasley, 2009). In fact, this information system combines technology features with pedagogy (Ioannou & Hannafin, 2008).

In general, there are two types of LMS services (Hamat, Embi, & Sulaiman, 2011; Perez & Perez, 2011).The first one is open-source, which is free and can be downloaded by anyone and the second is commercial which is often expensive (Perez & Perez, 2011). Some universities have also developed LMS by themselves. For example, Universiti Putra Malaysia (UPM) and Universiti Kebangsaan Malaysia (UKM) have developed PutraLMS and iFolio, respectively.

Although investing on LMS in institutional educations is enhancing, research has shown that most faculties and teachers are not interested in using technology (Hadjipavli, 2011; Stantchev, Colomo-Palacios, Soto-Acosta, & Misra, 2014). There are many factors that influence LMS utilization by lecturers and students and investigating them all is not possible. However, two significant models of Technology Acceptance Model and Fit Model are common in investigating factors that influence utilization of an information system (Dishaw & Strong, 1999).

1.2.1 LMS Acceptance

In his PhD dissertation, Davis (1986), cited in Davis, Bagozzi and Warshaw (1989), suggested Technology Acceptance Model which is based on the Theory of Reasoned Action (TRA). TRA is a social psychology theory proposed by Fishbein and Ajzen (1975) that has been successful in predicting and explaining human behavior; however, it is a general model and is not capable of explaining specified beliefs (Venkatesh, 2000). Unlike TRA, TAM is used only for computer technologies acceptance (Davis, 1993; Pituch & Lee, 2006). In the original TAM, the factors that have the key roles are perceived usefulness (PU) and perceived ease of use (PEU), which are called beliefs. Moreover, behavior intention to use (BI) and attitude toward use are mediators. After testing the original TAM, Davis et al. (1989) found that attitude had a weak influence on actual usage, and hence this construct was removed. As a result, the constructs of TAM were limited to PEU, PU, BI and system utilization.

Davis et al. (1993) argued that there is also a variety of external variables in TAM that determine PEU and PU, but in the original form of TAM, the external variables were not specified. However, it was argued that some variables such as system characteristics, organizational support, and user characteristics may be strong determinants of beliefs (perceived ease of use and perceived usefulness).These constructs (system characteristics, user characteristics, and organizational support) may encompass different variables (Venkatesh & Bala, 2008). For example, Igbaria (1990) and Igbaria, Guimaraes, and Davis (1995) considered the variables of technical support and management support as organizational support; gender, computer anxiety and computer experience as user characteristics; and system functionality, equipment performance, interaction, environment and the quality of user interface as system characteristics. Pituch and Lee (2006) suggested that the variables of system functionality, system interactivity, and system response belong to system characteristics, and user characteristics encompass self-efficacy and Internet experience. According to Ngai, Poon, and Chan (2007), organizational characteristics encompass technical support. Recently, Ke, Sun, and Yang (2012) have suggested that system characteristics embrace system interactivity, computer playfulness, and interface.

Fit Model, introduced by Goodhue and Thompson (1995), includes task characteristics, technology characteristics, task-technology fit (TTF), performance impacts, and utilization. The construct of TTF which investigates the fitness between task and functionality of the system is the core of Fit Model. The construct of technology characteristics measures the utilization of several technologies (e.g., laptop, software, tablet, LMS, etc.) through dummy variables and task characteristics

measure the types of tasks that individuals do in an organization (Goodhue, 1995). As TTF relates to system characteristics, it can be considered as system characteristics.

1.3 Problem Statement

Investigating the factors that make individuals accept or reject an information system is one of the most important issues regarding an information system (Davis et al. 1989; Venkatesh, Thong, & Xu, 2012). Due to the rapid growth of information technology and the complexity attached to it, the challenge for accepting these technologies in social environments has increased (Venkatesh & Bala, 2008). There are many cases in which a number of organizations have invested a huge budget to be equipped with an information system, yet they were faced with people's rejection and reluctance, and as a result their implementation ended in a failure.

Today, the growing use of ICT and learning technology has made many higher education institutions invest a substantial budget on LMS to support teaching and learning (Islam, 2013). For example, in 2007, almost all universities in Hong Kong were equipped with LMS (Ngai et al., 2007). The rate of using open-source LMSs such as Oriented Dynamic Learning Environment (Moodle) around the world substantially increased in such a way that according to Statistics Moodle reports, 73,749,126 people in 212 countries used Moodle in 2013 (Moodle Statistics, 2013).

In addition to the advantages of LMS for doing collaborative projects, constructing and managing knowledge, it is often used for delivery of contents and other less frequently-used features (Álvarez et al., 2013; Stantchev, 2014). Review of the related studies shows that although there is an enormous amount of research on online tools, only a few of them have investigated how students use online tools found within LMS (West & West, 2009; Wankel, 2011). Moreover, there are very few studies that have highlighted the roles of mediators on LMS utilization (Pituch & Lee, 2006; Ngai, et al., 2007, Wang & Wang, 2009). Mediation analysis is a powerful statistic technique for understanding the relationship between variables (Hair, Hult, Ringle, & Sarstedt, 2014; Kenny, 2014). However, in Malaysia, most of the studies on investigating factors related to LMS utilization either use descriptive statistics (e.g., by reporting mean, standard deviation, etc.) or are literature reviews and complicated procedures for data analysis such as mediation test and path analysis are less frequently employed (Adzharuddin & Ling, 2013; Ayub et al., 2010; Hilmi, Pawanchik**,** & Mustapha, 2012; Rahman, Ghazali, & Ismail, 2010).

Technology Acceptance Model is one of the popular and powerful models in studying the influence of external factors and mediators on information system utilization (Hair et al., 2014; Venkatesh & Bala, 2008).The two mediators of perceived ease of use and perceived usefulness play key roles in information system utilization. In fact, if students perceive that using LMS is productive and user friendly, they will certainly make use of it more (De Smet, Bourgonjon, Schellens, & Valcke, 2012; Ngai et al, 2007; Sánchez & Hueros, 2010; Van Raaij & Schepers, 2008). The other mediator which has an important role in LMS utilization is the behavior intention of users. In other words, the planning of students for using LMS is very important for enhancing system utilization (Liu, Chen, Sun, Wible, & Kuo, 2010; Motaghian, Hassanzadeh, & Moghadam, 2013; Ong, Lai, & Wang, 2004; Wang & Wang, 2009).

Based on the related literature, in the domain of TAM there are four categories of external factors which influence LMS utilization: a) system characteristics, b) social influence, c) organizational support, and d) individual differences (Venkatesh & Bala, 2008). In the present study, six external factors which cover the four categories were selected: system interactivity, system functionality and task-technology fit (system characteristics), subjective norm (social influence), technical support (organizational system), and Internet experience (individual differences).

Technical support, which includes giving service to users, has a significant role in technology acceptance (Sánchez & Hueros, 2010). When users receive no help from the assistants while being faced with a problem, they will get the feeling that working with the system is a waste of time and hence will quit working with it (Dżego & Pietruszkiewicz, 2012). Although technical support is one of the important factors that may influence LMS utilization, there is a paucity of empirical research that has investigated its influence on LMS use (Al-Busaidi & Al-Shihi, 2012). This is particularly important in the in context of Malaysia, since there only a few researchers who have investigated the role of technical support on LMS use (Adzharuddin & Ling, 2013; Sulaiman, 2013).

Internet experience, which is one of the variables of individual differences, refers to the frequency of using a variety of applications (Schumacher & Morahan-Martin, 2001; Tan & Teo, 2000). Since the features of LMS are similar to Internet tools, this construct has an important role in LMS utilization (Al- Busaidi & Al- Shihi, 2012; Igbaria et al., 1995; Park & Pobil, 2013).

Subjective norm refers to the influence of people who are important to us on our behavior (Venkatesh & Bala, 2008). There are several studies which have revealed that if students are encouraged by lecturers or educational managers of their university, they will feel that LMS is productive and their intention to use LMS will enhance (Motaghian, et al., 2013; Van Raaij & Schepers, 2008; Wang & Wang, 2009).

System functionality measures the flexibility and system quality from the users' point of view (Pituch & Lee, 2006). Lack of flexibility of system makes lecturers and students face problems concerning adjusting to the curricular needs and functionality of system and consequently they will not adopt the system (Ku, 2009). In fact, System interactivity provides opportunities for interaction among instructors and students and students with their peers in the process of teaching and learning. Therefore, Lack of system interactivity would have a negative influence on interaction between users and consequently system acceptance (Ke et al., 2012).

Task-technology fit, which is another variable of system characteristics, investigates the correspondence between task and functionality of system (Goodhue & Thompson, 1995). The results of several studies have revealed that the construct of task-technology fit can be considered as an external factor which is likely to influence information system utilization (Dishaw & Strong, 1999; Klopping & Mckinney, 2004; Larsen, Sørebø, & Sørebø, 2009; Lee & Lehto, 2013; Zhou, Lu, & Wang, 2010). After making a comprehensive search through the available literature, the researcher found no study that integrates task-technology fit as a factor that may influence LMS utilization with TAM. Therefore, in the present study, task-technology fit is considered as an external variable to fill this gap.

1.4 Objectives of the Research

1. To develop a model to predict factors that influence LMS utilization by undergraduate students.

2. To investigate the role of LMS perceived usefulness and LMS behavior intention to use as mediators for LMS utilization among undergraduate students.

3. To investigate the role of LMS perceived usefulness as a mediator for LMS behavior intention to use by undergraduate students.

4. To investigate the role of LMS perceived ease of use as a mediator for LMS perceived usefulness by undergraduate students.

1.5 Hypotheses

Objective 1

H_1: Task-technology fit has a significant influence on LMS utilization.

H_2: Task-technology fit has a significant influence on perceived usefulness of LMS.

H_3: Subjective norm has a significant influence on perceived usefulness of LMS.

H_4: Subjective norm has a significant influence on behavior intention to use of LMS.

H_5: System functionality has a significant influence on perceived usefulness of LMS.

H_6: System functionality has a significant influence on perceived ease of use of LMS.

H_7: Technical support has a significant influence on perceived usefulness of LMS.

H_8: Technical support has a significant influence on perceived ease of use of LMS.

H_9: System interactivity has a significant influence on perceived usefulness of LMS.

H_{10}: System interactivity has a significant influence on perceived ease of use of LMS.

H_{11}: Internet experience has a significant influence on perceived usefulness of LMS.

H_{12}: Internet experience has a significant influence on perceived ease of use of LMS.

H_{13}: Perceived ease of use of LMS has a significant influence on perceived usefulness of LMS.

H_{14}: Perceived ease of use of LMS has a significant influence on behavior intention to use of LMS.

H_{15}: Perceived usefulness of LMS has a significant influence on behavior intention to use of LMS.

H_{16}: Perceived usefulness of LMS has a significant influence on LMS use.

H_{17}: Perceived ease of use has a significant influence on LMS use.

H_{18}: Behavior intention to use of LMS has a significant influence on LMS use.

Objective 2

H_{19}: Perceived usefulness of LMS mediates the influence of task-technology fit on LMS use.

H_{20}: Behavior intention to use of LMS mediates the influence of perceived ease of use on LMS use.

H_{21}: Behavior intention to use of LMS mediates the influence of perceived usefulness of LMS on LMS use.

Objective 3

H_{22}: Perceived usefulness of LMS mediates the influence of perceived ease of use of LMS on behavior intention to use.

H_{23}: Perceived usefulness of LMS mediates the influence of subjective norm on behavior intention to use.

Objective 4

H_{24}: Perceived ease of use of LMS mediates the influence of system interactivity on perceived usefulness of LMS.

H_{25}: Perceived ease of use of LMS mediates the influence of technical support on perceived usefulness of LMS.

H_{26}: Perceived ease of use of LMS mediates the influence of system functionality on perceived usefulness of LMS.

H_{27}: Perceived ease of use of LMS mediates the influence of Internet experience on perceived usefulness.

1.6 Significance of the Study

Higher education is responsible for enhancing the quality of learning and human performance (Chang, 2008). Today, one of the most important purposes of Higher Education is supporting the process of teaching and learning with updated information through Information Technology (Stantchev et al., 2014). Currently, the great majority of universities are equipped with LMS to support teaching and learning process (Dutta et al., 2013). However, it seems that the functionality of LMS for supporting pedagogical goals is not fully employed (Alvarez et al., 2013). These types of studies also assist researchers to develop a scientific framework for understanding the role of external variables on an information system.

A strong model of LMS utilization will help universities and organizations to enhance their knowledge of individual management. These kinds of studies will help practitioners to find factors that prevent integrating new technologies with pedagogical aspects. Studies in the domain of system utilization are also important to assess success of a system (Alvarez et al., 2013). Therefore, managers will be able to overcome the limitation of systems in order to enhance the quality of learning activities. The patterns of actual use will increase perceptions of academic staff and educational policy makers (Ku, 2009). Indeed, adopting a new perspective in education may overcome the problems which influence students' acceptance in using a new technology and innovation (Lonn & Teasley, 2009). As the findings of previous studies show, by using TAM and Fit Model we can discover more factors that impact on technology utilization. Understanding more factors which influence acceptance of technology will extend the pedagogical horizons of educators (Dishaw & Strong, 1999).

The present study attempts to offer a better theoretical understanding of the factors which influence the use of LMS by undergraduate students. In the domain of TAM, there are three related approaches. The first approach belongs to the studies which work within the psychometric domain. The second approach includes studies which underpin the theoretical framework of TAM and the third approach includes studies in which researchers develop TAM by adding several constructs. The present study follows the third approach in the domain of TAM studies and will obviously add to the body of knowledge in the area of the third approach. Besides, its findings are likely to assist researches in identifying external variables through integrating TAM with other models.

This study may also provide a scientific framework for university lecturers about human performance regarding utilization of technology. In fact, when lecturers become aware of the factors which impact on accepting new technologies by their students, they will be in a better position to guide their students to use LMS and enhance the quality of their learning. This point in accepting LMS is crucial, because if lecturers are not aware of students' perception about its usefulness, effective integration of this technology with their teaching methodology and learning activities will prove to be difficult. The findings of the present study are likely help lecturers to realize how much of the students' coursework is fit with functionality of LMS system from the students' perspective. In this way, they can plan the tasks in such a way as to adjust more with system functionality.

When administrators are not aware of students' perspective, they may make an educational decision that adversely impacts on students' learning. The results of the present study will help university administrators and policy makers to learn about the factors that influence accepting or rejecting LMS by students, so they can make wise decisions in its implementation. The outcomes of the present research will also provide information to help technical support staff become aware of the quality of their service in students' perspectives.

Vendors and LMS designers often have the intention of updating the features and functionality of their systems according to the customer's needs. The significance of this study lies in helping LMS designers and vendors to improve LMS features in such a way that they become much easier to use and fit more with students' coursework. Therefore, in the new generation of LMS, vendors will be able to customize them according to students' needs.

1.7 Limitations of the Study

The population of this study is limited to undergraduate students of the faculty of educational studies at Universiti Putra Malaysia (UPM), Universiti Kebangsaan Malaysia (UKM) and Universiti Malaya (UM). Using LMS for undergraduate students is compulsory (Ayub et al., 2010). Therefore, LMS utilization among undergraduate students is more than post graduate students. The participants of the present study were full-time undergraduate students whose background, experience, and lifestyle may have been different from part time students.

The population of the present study was limited to undergraduate students of faculty of educational studies, because most of the undergraduate students of this faculty are pre-service teachers. In the 21st century, ICT skills for both teachers and students are necessary (Binkley, Erstad, Herman, Raizen, Ripley, & Rumble, 2010; Valtonen et al., 2013). Moreover, in Malaysia school teachers in real contexts need to assess several online systems such as e-penyata Gaji, Emis portal, system analisis peperiksaan, sistem aplikasi pangkalan, Data murid, sistem e-operasi, sistem pengurusan sekola, sistem pengurusaan pentaksiran and berasaskan sekola, which are provided by Malaysian Ministry of Education. To assess these systems, it is important for teachers to have experience of working with LMS. Finding the factors that influence LMS utilization of pre-service teachers assists educational managers to enhance LMS utilization and hence ICT skills of pre-service teachers.

There are different kinds of LMSs, but this study is limited to investigating the LMS of public universities of Universiti Putra Malaysia (UPM), Universiti Kebangsaan Malaysia (UKM) and Universiti Malaya (UM). These LMSs are PutraLMS (UPM), iFolio (UKM) and Spectrum (UM). The present study focused on measuring educational features and did not take into account measuring utilization of administration tools. Besides, the present study measured utilization of educational features common in PutraLMS (UPM), iFolio (UKM), and Spectrum (UM).

There are many external variables which may have an influence on LMS utilization. For example, self-efficacy (Pituch & Lee, 2006), habits (McGill & Klobas, 2009), flow experience (Hiramatsu & Nose, 2013; Park & Pobil, 2013), comfortable

environment (Hiramatsu & Nose, 2013). The present study, however, aims at investigating the influence of six external variables (Internet experience, system functionality, system interactivity, subjective norm, task-technology fit, and technical support) on LMS usage.

Although self-report inventory is a flexible technique and assists researchers to collect massive information quickly, it has also some limitation. First, the data collected through self-reports may result in the common method variance (Teo, 2009). Second, limitation is the structure of questions which may affect whether the reported information accurately measures the constructs under consideration (McDonald, 2008)

1.8 Definition of Terms

Task-technology fit

Task-technology fit is the correspondence between tasks and functionality of system (Goodhue & Thompson, 1995). In the context of LMS, McGill and Klobas (2009) consider task-technology fit as the ability of the LMS to support students in the range of learning activities they engage in, whilst accommodating the variety of student abilities. In this study, task-technology fit refers to the ability of PutraLMS (UPM), iFolio (UKM), and Spectrum (UM) to support learning activities of undergraduate students of UPM, UKM and UM to get engaged when using it.

To measure the fit between task and functionality of the system, we could have investigated the users' portfolios, but we chose another approach which asks users to express their beliefs about the extent of task-technology fit. Therefore, the instrument for measuring the fit between the task and functionality of the system was limited to a questionnaire.

Task

Task is defined as the actions carried out by individuals in turning inputs into outputs (Goodhue & Thompson, 1995). In the present study, task refers to any coursework activities such as assignments, quizzes, projects, and so on.

System functionality

System functionality is flexibility of an information system (Pituch & Lee, 2006). In this study, system functionality refers to undergraduate students' perception of flexibility of PutraLMS (UPM), iFolio (UKM), and Spectrum (UM) in accessing instructional and assessing media.

Internet experience

Schumacher and Morahan-Martin (2001) regarded Internet experience as the amount of experience in various application of the Internet. Tan and Teo (2000) also regarded Internet experience as using the various application of the Internet and

frequency of using it. In the present study, Internet experience is considered as frequency of using the various application of the Internet by undergraduate students of faculty of education at UPM, UKM, and UM.

System interactivity

System interactivity is the ability of the system to provide opportunities for interaction among users (Pituch & Lee, 2006). In this study, system interactivity refers to the ability of PutraLMS (UPM), iFolio (UKM), and Spectrum (UM) in providing facilities for interacting among students, the interactions between lecturers and students, and collaboration in learning which grows out of these interactions.

Technical support

Technical support is assisting people to solve problems they encounter when they are working with an information system (Ngai et al., 2007). In this study, technical support refers to the services assisting students to solve hardware and software problems with PutraLMS (UPM), iFolio (UKM), and Spectrum (UM) products.

Subjective norm

Subjective norm is the influence of people who are important to us in our minds to accept or to reject something (Venkatesh & Bala, 2008). In this study, subjective norm refers to the degree to which a student perceives that most people who are important to him/ her (lecturers, friends, classmates, university authorities), think s/he should or should not use PutraLMS (UPM), iFolio (UKM), and Spectrum (UM).

Perceived ease of use

Perceived ease of use is the degree to which an individual thinks that using the system is free of effort (Davis et al., 1989; Ngai et al., 2007). In this study, perceived ease of use refers to the degree to which undergraduate students believe that using PutraLMS (UPM), iFolio (UKM), and Spectrum (UM) will be free of effort.

Perceive usefulness

Perceived usefulness is the degree to which an individual believes that using a system will increase his/her performance (Davis et al., 1989; Ngai et al., 2007). In this study, perceived usefulness refers to the degree to which undergraduate students believe that using PutraLMS (UPM), iFolio (UKM), and Spectrum (UM) would enhance their learning performance.

Behavior intention to use

Behavior intention to use is supposed to capture the motivational factors which influence a special behavior (Davis et al., 1989). In this study, behavioral intention to use refers to the strength of an undergraduate student's intention to use PutraLMS (UPM), iFolio (UKM), and Spectrum (UM).

System Utilization

System utilization is the behavior of employing technology in completing tasks and measures such as the frequency of use or the diversity of applications (Davis et. al. 1989). Wang and Wang (2009) regarded LMS utilization as the use of features for transmitting information and communication. In the present study, LMS utilization refers to diversity of use. In fact, it measures the utilization of transforming information tools (downloading course materials, lecturer notes, sending assignments, taking quizzes, calendar & events, report progress, etc.) and communication tools (forum, chat room, email aUnd etc.) of PutraLMS (UPM), iFolio (UKM) and Spectrum (UM). We only measured the tools which were common in PutaLMS (UPM), iFolio (UKM), and Spectrum (UM).

REFERENCES

Adzharuddin, N. A., & Ling, L. H. (2013). Learning Management System (LMS) among university students: Does it work? *International Journal of e-Education, e-Business, e-Management and e-Learning*, *3*(3), 248-252.

Ajjan, H., & Hartshorne, R. (2008). Investigating faculty decisions to adopt Web 2.0 technologies: Theory and empirical tests. *The Internet & Higher Education*, *11*(2), 71-80.

Al-Busaidi, K. A., & Al-Shihi, H. (2012). Critical factors influencing instructors' acceptance and use of learning management systems. In R. Babo & A. Azevedo (Eds.), *Higher education institutions and learning management systems*. (pp. 116-140). Hershey, PA: Information Science Reference.

Álvarez, A., Martín, M., Fernández-Castro, I., & Urretavizcaya, M. (2013). Blending traditional teaching methods with learning environments: Experience, cyclical evaluation process and impact with MAgAdI. *Computers & Education*, *68*, 129-140.

Ary, D., Jacobs, L. C., & Sorensen, C. K. (2010*). Introduction to research in education* (8th ed.). Wadsworth: Belmont.

Ayub, A. F. M., Tarmizi, R. A., Jaafar, W. M. W., Ali, W. Z. W., & Luan, W. S. (2010). Factors influencing students' use a learning management system portal: Perspective from higher education students. *International Journal of Education and Information Technologies*, *2*(4), 100-108.

Babo, R., Rodrigues, A. C., Rodrigues, A. C., Lopes, C. T., de Oliveria, P. C., Queirós, R., & Pinto, M. (2012). *Difference in Internet and LMS usage: A case study in higher education.* In R. Babo & A. Azevedo (Eds.), *Higher education institutions and learning management systems* (pp. 247-270). Hershey, PA: Information Science Reference.

Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, *16*(1), 74–94.

Bainbridge, F. A. & Keeshan, N. M. (2013). *Persuation: Integrating theory, research and practice* (3rd ed.). Kendall Hunt Publishing.

Bartlett, J. E., Kotrlik, J. W., Higgins, C. C. (2001). Organizational Research: Determining Appropriate sample size in survey research. *Information Technology, Learning, and Performance Journal*, *19*(1), 43-50.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173-1182.

Behrens, J. T. (1997). Principles and procedures of exploratory data analysis. *Psychological Methods*, *2*(2), 131-160

.

Bennett, S., Bishop, A., Dalgarno, B., Waycott, J., & Kennedy, G. (2012). Implementing Web 2.0 technologies in higher education: A collective case study. *Computers & Education*, *59*(2), 524-534.

Bentler, P. M. (1990). Comparative fit indices in structural models. *Psychological Bulletin*, *107*, 238-246.

Biasutti, M., EL-Deghaidy, H. (2012). Using Wiki in teacher education: Impact on knowledge management processes and student satisfaction. *Computers & Education*, *59*(3), 861–872.

Biemer, P. P., Dowd, K., & Webb, M. B. (2010). Study design and methods. In M. B. Webb, K. Dowd, B. J. Harden, J. Landsverk, & M. Testa (Eds.), *Child welfare and child well-being: New perspectives from the national survey of child and adolescent well-being* (pp. 1-54). Oxford: Oxford University Press.

Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., & Rumble, M. (2010). *Defining 21st century skills*. Assessment and teaching of 21st century skills project draft white papers.

Blessing, L. T. M., & Chakrabarti, A. (2009). DRM: A design research methodology. London: Springer.

Bodle, R. (2011). Social learning with social media: Expanding and extending the communication studies classrooms. In C. Wankel (Ed.), *Cutting-edge technologies in higher education: Teaching arts and science with the new social media* (pp. 107-126). Bingley: Emerald Group Publishing.

Bollen, K. A., & Stine, R. (1990). Direct and indirect effects: Classical and bootstrap estimates of variability. *Sociological Methodology*, *20*(1), 115-140.

Boomsma, A., & Hoogland, J.J. (2001). The robustness of LISREL modeling Revisited.In R. Cudeck, S. Du Toit, & D. Sörbom (Eds.), *Structural equation models: Present and future. A Festschrift in Honor of Karl Jöreskog* (pp. 139-168). Chicago, IL: Scientific Software International.

Bradford, P., Porciello, M., Balkon, N., & Backus, D. (2007). The Blackboard learning system. *The Journal of Educational Technology Systems*, *35*, 301-314.

Brown, W., & Brown, I. (2008). Next generation ICT policy in South Africa: Towards a human development-based ICT policy. In C. Avgerou, M. L. Smith, & P. V. D. Besselaar (Eds.), *Proceedings of 8th international conference on human choice and computers (HCC8), IFIP TC 9* (pp. 109-123). South Africa: Springer.

Byrne, B.M. (2010). *Structural equation modeling with AMOS*: Basic concepts, applications, and programming (2nd ed.). New York, NY: Routledge.

Chang, C. L. (2008). *Faculty perceptions and utilization of a learning management system in higher education* (Doctoral dissertation, Ohio University, USA). Retrieved from ProQuest Dissertation and Theses database (UMI No: 3319031).

Chang, H. H. (2010). Task-technology fit and user acceptance of online auction. *International Journal of Human-Computer Studies*, *68*(1-2), 69-89.

Chatfield, T. B. (2009). *The complete guide to wikis: How to set up, use, and benefit from wikis for teachers, business professionals, families and friends*. Ocala, FLA: Atlantic Publishing Group.

Chatzis, S. P., Korkinof, D., & Demiris, Y. (2012). A nonparametric Bayesian approach toward robot learning by demonstration. *Robotics and Autonomous Systems*, *60*(6), 789-802.

Chen, C-Y., & Teng, K-C. (2011). The design and development of a computerized tool support for conducting senior projects in software engineering education. *Computers & Education, 56*(3), 802-817.

Cheung, G.W., & Lau, R. S. (2008). Testing mediation and suppression effects of latent variables: Bootstrapping with structural equation models. *Organizational Research Methods*, *11*(2), 296-325.

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling*, *9*(2), 233-255.

Chin, W.W. (1998). The partial least squares approach to structural equation modeling. In G. A. Marcoulides (Ed.), *Modern methods for business research* (pp.295-336). Mahwah, NJ: Lawrence Erlbaum Associates.

Clark, R., C., & Mayer, R. E. (2011). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (3rd ed.). San Francisco: John Wiley & Sons.

Coates, H., James, R., & Baldwin, G. (2005). A critical examination of the effects of learning management systems on university teaching and learning. *Tertiary Education & Management, 11*(1), 19-36.

Cochran, W. G. (1977). *Sampling techniques* (3rd ed.). New York: John Wiley & Sons.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6th ed.). London: Routledge.

Cole, J., & Foster, H. (2008). *Using Moodle: Teaching with the popular open source course management system*. Sebastopol, CA: O'Reily Media, Inc.

Coltman, T., Devinney, T. M., Midgley, D. F., & Venaik, S.(2008). Formative versus reflective measurement models: Two applications of formative measurement. *Journal of Business Research, 61*(10), 1250–1262.

Connolly, T., Gould, C., Baxter, G., & Hainey, T. (2012). Learning 2.0: Using Web 2.0 technologies for learning in an engineering course. In R. Babo & A. Azevedo (Eds.), *Higher education institutions and learning management systems* (pp. 50-73). Hershey, PA: Information Science Reference.

Davis, F. D. (1986). *A Technology Acceptance Model for empirically testing new end-user Information Systems: Theory and results*. Unpublished doctoral dissertation. Sloan School of Management, Massachusetts Institute of Technology, USA.

Davis, F. D. (1993). User acceptance of information technology: System characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies, 38*(3), 475-487.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*(8), 982–1003.

Davis, K.,Weigel, M., & Gardner, H. (2009). Social development in the era of new digital media. Retrieved April 2011 from: http://pzpublication.com/410.html.

Denscombe, M. (2010). *The good research guide for small-scale social research projects* (4th ed.). Maidenhead, UK: Open University Press.

De Smet, C., Bourgonjon, J., Wever, B. D., Schellens, T., & Valcke, M. (2012). Researching instructional use and the technology acceptation of learning management systems by secondary school teachers. *Computers & Education, 58*(2), 688-696.

Deters, F., Cuthrell, K., & Stapleton, J. (2010). Why wikis? Student perceptions of using wikis in online coursework. *MERLOT Journal of Online Learning and Teaching, 6*(6), 122-134.

Detschew, S. (2007). *Impact of ICT in the developing countries on the economic growth: Implications derived from theory and empiricism*. Norderstedt: Grin Verlag.

Dishaw, M.T., & Strong, D. M. (1999). Extending the technology acceptance model with task-technology fit constructs. *Information & Management, 36*(1), 9-21.

Douglas, I. (2010). Improving the tracking of student participation and effort in effort in online learning. In Y. Kats (Ed.), *Learning management system technologies and software solutions for online teaching: Tools and applications* (pp. 173-186). Hershey, PA: Information Science Reference.

Dutta, A., Roy, R., & Seetharaman, P. (2013). Course management system adoption and usage: A process theoretic perspective. *Computers in Human Behavior, 29*(6), 2535–2545.

Dżega, D., & Pietruszkiewicz, W. (2012). The technological advancement of LMS systems and e-content software. In R. Babo & A. Azevedo (Eds.), *Higher education institutions and learning management systems* (pp. 219-245). Hershey, PA: Information Science Reference.

Embi, M. A., Atan, H., & Hamat, A. (2011). Summary of findings on the status, trends, & challenges of e-learning implementation. In M. A. Embi (Ed.). *E-learning in Malaysian Higher Educations: States, trends, and challenges* (pp.107-115). Department of Higher Education, Ministry of Higher Education.

Embi, M. A., Hamat, A., Sulaiman, A. H. (2012). The use of learning management systems among Malaysian university lecturers. *The International Journal of Learning*, *18*(4), 61-70.

Embi, M. A., Wahab, Z. A., Sulaiman, A. H., & Atan, H. (2011). Introduction. In M. A.Embi (Ed.). *E-Learning in Malaysian Higher Education institutions: Status, trends, and challenges* (pp.1-4). Department of Higher Education, Ministry of Higher Education.

Embi, M A. iFolio: Engaging teaching & learning. Retrieved September, 2013 from: http://www.slideshare.net/adiirfan/taklimat-ifolio-pelajar.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Menlo Park, CA: Addison-Wesley Publishing Company.

Folden, R. W. (2012). General perspective in learning management systems. In R. Babo & A. Azevedo (Eds.), *Higher education institutions and learning management systems* (pp.1-27). Hershey, PA: Information Science Reference.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing*, *1*(1), 39-50.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). *How to design and evaluate research in education* (8th ed.). Boston: McGraw-Hill.

Franzen, M. D. (2000*). Reliability and validity in neuropsychological assessment* (2nd ed.). New York: Springer.

Fridin, M. (2014). Kindergarten social assistive robot: First meeting and ethical issues. *Computers in Human Behavior*, *30*, 262–272.

Gardner, H. (1999). *Intelligence reframed: Multiple intelligences for the 21st century*. New York: Basic Books.

Garson, D. (2012). *Structural equation modeling*. Ashebro, NC: Statistical Associates Publishing.

Gay, L. R., Mills, G. E., & Airasian, P. W. (2006). *Educational research: Competencies for analysis and applications* (8th ed.). New Jersey: Prentice Hall.

George, D., & Mallery, P. (2008). *SPSS for windows step by step: A simple guide and reference 15.0 update* (8th ed.). Boston, MA: Pearson Education.

Goh, P. S. C. (2012). The Malaysian teacher standards: A look at the challenges and implications for teacher educators. *Educational Research for Policy and Practice*, *11*(2), 73-87.

Goodhue, D. L. (1995). Understanding user evaluations of information systems. *ProQuest Psychology Journal*, *41*(12), 1827-1844.

Goodhue, D. L. (1998). Development and measurement validity of a task-technology fit instrument for user evaluations of information systems. *ProQuest Science Journal*, *29*(1), 105-138.

Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. *MIS Quarterly*, *19*(2), 213-236.

Hadjipavli, E. (2011). *An examination of Cypriot teachers' concerns regarding the adoption of a learning management system in secondary education* (Doctoral dissertation, Northcentral University, Arizona, USA). Retrieved from ProQuest Dissertations and Theses database. (UMI No 3467400)

Hair, J. F., Black, W.C., Babin, B. J., & Anderson, R. E. (2010), *Multivariate data analysis* (7th ed.). New Jersey: Prentice-Hall.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt (2014*). A primer on partial least squares structural equation modeling (PLS-SEM)*, Los Angeles: Sage.

Halic, O., Lee, D., Paulus, T., & Spence, M. (2010). To blog or not to blog: Student perceptions of blog effectiveness for learning in a college- level course. *The Internet and Higher Education*, *13*(4), 206-213.

Hamat, A., Embi, M. A., Sulaiman, & A. H. (2011). Learning Management systems in Malaysian Higher Education institutions. In M. A. Embi (Ed.), *E-Learning in Malaysian Higher Education institutions: Status, trends, and challenges* (pp.29-51). Department of Higher Education, Ministry of Higher Education.

Hamuy, E., & Galaz, M. (2010). Information versus communication in course management system participation. *Computers & Education*, *54*(1), 169–177.

Hart, M. (2007). *What does it mean to integrate technology in education? A grounded theory study* (Doctoral dissertation, Hofstra University, Hempstead, NY, USA). Retrieved from ProQuest dissertation and Theses database. (UMI No: 3299426).

Harrington, D. (2009). *Confirmatory factor analysis: Pocket guides to social work research methods*. New York: Oxford University Press.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York: Guilford Press.

Hernandez, B., Montaner, T., Sese, F. J., & Urquizu, P. (2011). The role of social motivations in e-learning: How do they affect usage and success of ICT interactive tools? *Computers in Human Behavior, 27*(6), 2224-2232.

Hertzog, M. (2008). Consideration in determining sample size for pilot study. *Research in Nursing & Health, 31*(2), 180-191.

Hibberts, M., Johnson, R. B., & Hudson, K. (2012).Common survey sampling techniques. In L. Gideon (Ed.), *Handbook of survey methodology for the social sciences* (pp. 54-74). New York: Springer.

Hilmi, M. F., Pawanchik, S., & Mustapha, Y. (2012). Perceptions on service quality and ease-of-use: Evidence from Malaysian Distance Learners. *Malaysian Journal of Distance Education*, *14*(1), 99-110.

Hill, N. S., & Wouters, K. (2010). Comparing apples and oranges: Toward a typology for assessing e-learning effectiveness. In H. Liao, J.J. Martocchio, & A. Joshi (Eds.), *Research in personnel and human resources management: Volume 99* (pp. 201-242). Bingley, UK: Emerald.

Hiramatsu, A., & Nose, K. (2013). Behavior analysis of video hosting website users based on an extended technology acceptance model. In T. Matsuo & R. Colomo-Palacios (Eds.), *Electronic business and marketing: New trends on its process and applications* (pp. 125-136). Berlin Heidelberg: Springer-Verlag.

Ho, R. (2006). *Handbook of univariate and multivariate data analysis and interpretation with SPSS*. New York: CRC Press.

Holmes, B., & Gardner, J. (2006). *E-learning: Concepts and practice*. London: Sage Publications.

Hsu, C-L., & Lin, J.C-C. (2008). Acceptance of blog usage: The roles of technology acceptance, social influence and knowledge sharing motivation. *Information & Management*, *45*(1), 65–74.

Hughes, J. E. & Narayan, R. (2009). Collaboration and learning with wikis in post-secondary classrooms. *Journal of Interactive Online Learning*, *8*(1), 63-82.

Hughes, J., Kerr, S., P., & Ooms, A. (2005). Content-focused technology inquiry groups: Cases of teacher learning and technology integration. *Journal of Educational Computing Research*, *32*(4), 367-379.

Igbaria, M. (1990). End-user computing effectiveness: A structural equation model. *Omega-International Journal of Management Science*, *18*(6), 637-652.

Igbaria, M., Guimaraes, T., & Davis, G. B. (1995). Testing the determinants of microcomputer usage via a structural equation model. *Journal of Management Information Systems*, *11*(4), 87–114.

Im, K. S., & Grover, V. (2004). The use of structural equation modeling in IS research. In M. E. Whitman & Woszczynski (Eds.), *The handbook of information systems research* (pp. 44-65). Hershey, PA: Idea group publishing.

Islam, A.K.M.N. (2013). Investigating e-learning system usage outcomes in the university context, *Computers & Education*, 69, 387-399.

Ioannou, A., & Hannafin, R. (2008). Deficiencies of course management systems: Do students care*? The Quarterly Review of Distance Education*, *9*(4), 415–425.

James, L. R., & Brett, J. M. (1984). Mediators, moderators and tests for mediation. Journal of Applied Psychology, 69, 307-321.

Jones, A. (2011). How Twitter saved my literature class: A case study with discussion. In C. Wankel (Ed.), *Cutting-edge technologies in higher education: Teaching arts and science with the new social media* (pp. 91-105). Bingley: Emerald Group Publishing.

Judd, C. M., & Kenny, D. A. (1981). Process analysis: Estimating mediation in treatment evaluations. Evaluation Review, 5, 602-619.

Junco, R. (2012a). Too much face and not enough books: The relationship between Multiple indices of Facebook use and academic performance. *Computers in Human Behavior*, *28*(1), 187-198.

Junco, R. (2012b).The relationship between frequency of Facebook use, participation in Facebook activities, and student engagement. *Computers & Education*, *58*(1), 162-171.

Kabilan, M. K., Ahmad, N., & Zainol Abidin, M. J. (2010). Facebook: An online environment for learning of English in institutions of higher education? *The Internet & Higher Education*, *13*(4), 179-187.

Kaplan, R. M., & Saccuzzo, D. P. (2012). *Psychological testing: Principles, applications, and issues* (8th ed.). Belmont, CA: Wadsworth.

Ke, C. H., Sun, H. M., & Yang, Y. C. (2012). Effects of user and system characteristics on perceived usefulness and perceived ease of use for the web-based classroom response system. *The Turkish Online Journal of Educational Technology*, *11*(3), 128-143.

Kear, K. (2011). *Online and social networking communities: A best practice guide for educators*. New York: Routledge.

Kekwaletswe, R. M. (2012). Knowledge sharing in a learning management system environment using social awareness. In R. Babo & A. Azevedo (Eds.), *Higher*

education institutions and learning management systems (pp. 28-49). Hershey, PA: Information Science Reference.

Kenny, D. A. (2014). Mediation. Retrieved July 2014 from: http://davidakenny.net/cm/mediate.htm.

Kerka, S. (1996). *Distance learning, the Internet and the World Wide Web. EricDigst.* Retrieved September 2012 from: http://www.ericdigests.org/1997-1/distance.html.

Killoran, J. B. (2013). Reel-to-reel tapes, cassettes, and digital audio media: Reverberations from a half-century of recorded-audio response to student writing. *Computers and Composition*, *30*(1), 37-49.

Kinuthia, W., & Marshall, S. (Eds.). (2010). *Educational technology in practice: Research and practical case studies from the field*. Charlotte, NC: Information Age Publishing.

Kline, R. B. (2011). *Principles and practice of structural equation modeling* (3rd ed.). New York: Guilford Press.

Klopping, I., & McKinney, E. (2004). Extending the technology acceptance model and the task-technology fit model to consumer e-commerce. *Information Technology, Learning, and Performance Journal, 22*(1), 35-48.

Krysik, J. L., & Finn, J. (2010). *Research for effective social work practice* (2nd ed.) New York: Routledge.

Ku, C-H., (2009). *Extending the technology acceptance model using perceived user resources in higher education web-based online learning courses* (Doctoral dissertations, The University of Central Florida, USA). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3357904)

Kumar, C. R. (2011). *Research methodology: A step by step guide for beginners*. London: Sage Publications.

Lai, Y. C., Ng, E. M. W. (2011). Using wikis to develop student teachers' learning, teaching, and assessment capabilities. *The Internet and Higher Education*, *14*(1), 15- 26.

Lam, P., Lo, J., Lee, J., & McNaught, C. (2012). Evaluations of online activities based on LMS logs. In R. Babo & A. Azevedo (Eds.), *Higher education institutions and learning management systems* (pp. 75-93). Hershey, PA: Information Science Reference.

Larsen, T. J., Sørebø, A. M., Sørebø, Ø. (2009). The role of task-technology fit as users' motivation to continue information system use. *Computers in Human Behavior*, *25*(3), 778–784.

Latchem, C., & Jung, I. (2010). *Distance and blended learning in Asia*. New York: Routledge.

Lee, C-H., Chan, J. Thanimalay, N., & Lim, J-T. (2012). Study of student preferences in using the university default learning management system versus the weblog in learning and teaching. In P. Lam (Ed.), *Proceedings of the 7th international conference on e-learning* (pp. 251-258). Reading, UK: Academic Publishing.

Lee, D. Y., & Lehto, M. R. (2013). User acceptance of YouTube for procedural learning: An extension of the technology acceptance model. *Computers & Education*, *61*(1), 193-208.

Lee, Y-H., Hsieh, Y-C., & Chen, Y-H. (2013). An investigation of employees' use of e-learning systems: Applying the technology acceptance model. *Behavior & Information Technology*, *32*(2), 173-189.

Leech, N. L., Barrett, K. C., & Morgan, G. A. (2008). *SPSS for intermediate Statistics: Use and interpretation*. New York: Routledge.

Leflay, K., Groves, M. (2013). Using online forums for encouraging higher order thinking and "deep" learning in an undergraduate sports sociology module. *Journal of Hospitality, Leisure, Sport & Tourism Education*, *13*, 226-232.

Legris, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information and Management*, *40*(3), 1–14.

Lei, P. W., & Wu, Q. (2007). Introduction to structural equation modeling: Issues and practical considerations. *Educational Measurement: Issues and Practice*, *26*(3), 33-43.

Lin, W. H., & Wang, C. H. (2012). Antecedences to continued intentions of adopting e-learning system in blended learning instruction: A contingency framework based on models of information system success and task-technology fit. *Computers & Education*, *58*(1), 88-99.

Liu, I-F., Chen, M. C., Sun, Y. S., Wible, D., & Kuo, C-H. (2010). Extending the TAM model to explore the factors that affect intention to use an online learning community. *Computers & Education*, *54*(2), 600-610.

Liu, X. (2010). Empirical testing of a theoretical extension of the technology Acceptance model: An exploratory study of educational wikis. *Communication Education*, *59*(1), 25-69.

Lonn, S., & Teasley, S. D. (2009). Saving time or innovating practice: Investigating perceptions and uses of learning management systems. *Computers & Education*, *53*(3), 686-694.

MacDermid, J., & Michlovitz, S. (2008).Incorporating outcomes measures into evidence-based practice. In M. Law & J. MacDermid (Eds.), *Evidence-based rehabilitations: A guide to practice* (2nd ed.) (pp. 64-94). Thorofare, NJ: Slack Incorporated.

Macdonald, J. (2008). *Blended learning and online tutoring: Planning learner support and activity design* (2nd ed.). Hampshire, UK: Gower Publishing.

MacKinnon, D. P., Lockwood, C. M., & Williams, J. (2004). Confidence Limits for the Indirect Effect: Distribution of the Product and Resampling Methods. *Multivariate Behavioral Research, 39*(1), 99-128.

Mahlow, C. (2010). Choosing the appropriate e-learning system for a university. In Y. Kats (Ed.), *Learning management system technologies and software solutions for online teaching: Tools and applications* (pp. 57-80). Hershey, PA: Information Science Reference.

Marsh, H. W., Hau, K. T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Benler's (1999) findings. *Structural Equation Modeling, 11*(3), 320–341.

McDonald, J. D. (2008). Measuring personality constructs: The advantages and disadvantages of self-reports, information reports and behavior assessments. *ENQUIRE, 1*(1), 1-18.

McGill, T.J., & Klobas, J. E. (2009). A task-technology fit view of learning management system impact. *Computers & Education, 52*(2), 496-508.

McGourty, J., & Risquez, A. (2010). Technology enhanced distance learning utilizing Sakai CLE and Adobe Connect Pro. In Y. Kats (Ed.), *Learning management system technologies and software solutions for online teaching: Tools and applications* (pp. 81-98). Hershey, PA: Information Science Reference.

McQuitty, S. (2004). Statistical power and structural equation models in business research. *Journal of Business Research, 57*(2), 175-183.

Mena, R. J. R. (2010). Best practices for teaching and designing a pure online science classroom. In Y. Kats (Ed.), *Learning management system technologies and software solutions for online teaching: Tools and applications* (pp. 291-313). Hershey, PA: Information Science Reference.

Meyers, L. S., Gamst, G., & Guarino, A. J. (2006). *Applied multivariate research: Design and interpretation*. Thousand Oaks, CA: Sage Publications.

Miyazoe, T., & Anderson, T. (2012). Discuss, reflect and collaborate: A qualitative analysis of forum, blog, and wiki use in an EFL blended learning course. *Procedia-Social and Behavioral Sciences, 34*, 146-152.

Moodle Statistics (2013). Retrieved October 2013 from: https://moodle.org/stats/.

Moreno-Clari, P., & Sanchis-Kilders, E. (2010). Integrating new open source assessment tools into dotLearn LMS. In Y. Kats (Ed.), *Learning management system technologies and software solutions for online teaching: Tools and applications* (pp. 219-237). Hershey, PA: Information Science Reference.

Motaghian, H., Hassanzadeh, A., Moghadam, D. K. (2013). Factors affecting university instructors' adoption of web-based learning systems: Case study of Iran. *Computers & Education, 61*, 158-167.

Ng, E. M. W., Yuen, R.T. M., Leung, W. N. (2013). Ready for 21st-century education – pre-service music teachers embracing ICT to foster student-centered learning. *Procedia-Social and Behavioral Sciences*, *73*, 240-245.

Ngai, E. W. T., Poon, J. K. L., & Chan, Y. H.C. (2007). Empirical examination of the adoption of WebCT using TAM. *Computers & Education, 48*(2), 250–267.

Nussbaum, M., Diaz, A. (2013). Classroom logistics: Integrating digital and non-digital resources. *Computers & Education, 69*, 493-495.

Offredy, M., & Vickers, P. (2010). *Developing a healthcare research proposal: An interactive student guide*. Oxford: Wiley-Blackwell.

O'Mahony, C. (2004). E-learning component evolution and integration: A case study. *International conference on computers in Education 2004*. Retrieved September 2012 from: http://plum.yuntech.edu.tw/icce2004/Theme3/083_OMahany.pdf.

Ong, C-S, Lai, J-Y, & Wang, Y-S. (2004). Factors affecting engineers' acceptance of asynchronous e-learning system in high tech companies. *Information & Management, 41*(6), 795–804.

Ozkan, S., Koseler, R., & Baykal, N. (2009). Evaluating learning management Systems: Adoption of hexagonal e-learning assessment model in higher education. *Transforming Government: People, Process and Policy*, *3*(2), 111-130.

Pallant, J. (2010). *SPSS survival manual: A step by step guide to data analysis using SPSS* (4th ed.). Berkshire: Open University Press.

Park, E., & Pobil, A. P. D. (2013). Technology acceptance model for the use of tablet PCs. *Wireless Personal Communications*, *73*(4), 1561-1572.

Perez, B. A. & Perez, T. J. (2011). *Choosing the right learning management system*. North Charleston: Nort Charleston, SC: CreateSpace.

Piña, A. A. (2010). An overview of learning management systems. In Y. Kats (Ed.), *Learning management system technologies and software solutions for online teaching: Tools and applications* (pp. 1-19). Hershey, PA: Information Science Reference.

Piotrowski, M. (2010). What is an e-learning platform? In Y. Kats (Ed.), *Learning management system technologies and software solutions for online teaching: Tools and applications* (pp. 20-36). Hershey, PA: Information Science Reference.

Pituch, K. A., & Lee, Y-K. (2006). The influence of system characteristics on e-learning use. *Computers & Education, 47*(2), 222-244.

Puteh, M. (2007). E-learning in Malaysia public universities: Case studies of Universiti Kebangsaan Malaysia and Universiti Teknologi Malaysia. In *proceedings of the first International Malaysian Educational Technology convention* (pp. 825-834). Johor Bahru, Malaysia, 2-5 November 2007.

Putra Learning Management System (2013). PuraLMS User Manual Retrieved from: http://www.lms.upm.edu.my/i3learn/www/help.htm.

Rahman, K., A., Ghazali, S. A. M., & Ismail, M. N. (2010). The effectiveness of Learning Management System (LMS): Case study at Open University Malaysia (OUM), Kota Bharu Campus. *Journal of Emerging Trends in Computing and Information Sciences, 2*(2), 73-79.

Raja Maznah, R. H. (2004). E-learning in higher education institutions in Malaysia. Retrived October 2012 from: http://Idms.oum.edu.my/oumlib/sites/default/files/file_attavhments//odlresources/4322/elearning-higher.pdf.

Raman, A., & Don, Y. (2013). Pre-service teachers' acceptance of Learning Management Software: An Application of the UTAUT2 model. *International Education Studies, 6*(7), 157-164.

Raoprasert, T., & Islam, S. M. N. (2010). *Designing an efficient management system: Modeling of convergence factors exemplified by the case of Japanese businesses in Thailand*. Berlin: Physica.

Rasul, S., Bukhsh, Q., & Batool, S. (2011). A study to analyze the effectiveness of audio visual aids in teaching learning process at university level. *Procedia – Social and Behavioral Sciences, 28*, 78-81.

Rather, A. R. (2004). *Essentials of instructional technology*. New Delhi: Discovery Publishing House.

Raykov, T., & Marcoulides, G. A. (2006). *A first course in structural equation Modeling* (2nd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.

Richardson, W. (2010). *Blogs, wikis, podcasts and other powerful web tools for classroom* (3rd ed.). Thousand Oaks, CA: Corwin.

Roblyer, M. D. & Doering, A. H. (2010). *Integrating technology into teaching* (5th ed.) Boston, MA: Allyn & Bacon.

Roblyer, M. D. McDaniel, M., Webb, M., Herman, J., & Witty, J. V. (2010). Findings on Facebook in higher education: A comparison of college faculty and student uses and perceptions of social networking sites. The *Internet and Higher Education*, *13*(3), 134-140.

Saadé, R. G., Morin, D., & Thomas J. D. E. (2012). Critical thinking in e-learning environments. *Computers in Human Behavior*, *28*(5), 1608-1617.

Sadaf, A., Newby, T. J., & Ertmer, P. A. (2012). Exploring pre-service teachers' beliefs about using Web 2.0 technologies in K-12 classroom. *Computers & Education*, *59*(3), 937–945.

Saettler, P. (2004). *The evolution of American educational technology*. Greenwich, CT: Information Age Publishing.

Sánchez, R. A., & Hueros, A. D. (2010). Motivational factors that influence the acceptance of Moodle using TAM. *Computers in Human Behavior*, *26*(6), 1632–1640.

Sánchez, R. A., Cortijo, V., & Javed, U. (2014). Students' perceptions of Facebook for academic purposes. *Computers & Education*, 70, 138–149.

Schumacher, P., & Morahan-Martin, J. (2001). Gender, Internet and computer attitudes and experiences. *Computers in Human Behavior*, *17*(1), 95-110.

Schumacker, R. E., & Lomax, R. G. (2010). A *beginner's guide to structural equation modeling* (3rd ed.). New York, NY: Routledge.

Sekaran, U., & Bougie, R. (2010). *Research methods for business: A skill-building approach* (5th ed.). West Sussex: Wiley.

Selim Ahmed, H. M. (2010). Hybrid e-learning acceptance model: Learner perceptions. *Decision Sciences: Journal of Innovative Education*, *8*(2), 313-346.

Selim, H. M. (2003). An empirical investigation of student acceptance of course websites. *Computers & Education*, *40*(4), 343-360.

Seyal, A. H., Abd Rahman, M. N., & Rahim, M. D. (2002). Determinants of academic use of the Internet: A structural equation model. *Behavior & Information Technology*, *21*(1), 71-86.

Shittu, A. T., Basha, K. M., AbdulRahman, N. S. N., & Ahmad, T. B. T. (2011). Investigating students' attitude and intention to use social software in higher institution of learning in Malaysia. *Multicultural Education & Technology Journal*, *5*(3), 194-208.

Smaldino, S. E., Lowther, D. L., & Russell, J. D. (2011). *Instructional technology and media for learning* (10th ed.). Boston, MA: Allyn & Bacon.

Spectrum: Student Powered, e-Collaboration, Transforming UM (2013). Spectrum V2. Retrieved From: http://arkib.spectrum.um.edu.my/sess1213sem1/.

Stantchev, V., Colomo-Palacios, R., Soto-Acosta, P., & Misra, S. (2014). Learning management systems and cloud file hosting services: A study on students' acceptance. *Computers in Human Behavior*, *31*, 612-619.

Stein, D.S., Wanstreet, C. E., Slagle, P., Trinko, L. A., & Lutz, M. (2013). From 'hello' to higher-order thinking: The effect of coaching and feedback on online chats. *Internet & Higher Education*, *16*, 78-84.

Šumak, B., Heričko, M., & Pušnik, M. (2011). A meta-analysis of e-learning technology acceptance: The role of user types and e-learning technology types. *Computers in Human Behavior*, *27*(6), 2067-2071.

Sulaiman, F. (2013). Malaysian undergraduate science physics students' and pre-service science teachers' perceptions of online learning. *Basic Research Journal of Education Research and Review*, *2*(5), 76-80.

Svendsen, G. B., Johnson, J-A. K., Sørensen, L. A., &Vittersø, J. (2013). Personality and technology acceptance: The influence of personality factors on the core constructs of the technology acceptance model. *Behavior & Information Technology*, *32*(4), 323-334.

Tabachnick, B. G. & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston: Pearson Education

Tan, M., & Teo, T. S. H. (2000). Factors influencing the adoption of Internet banking. *Journal of the Association for Information Systems*, *1*(Art. 5). 1-42.

Tello, S. & Motiwalla, L. (2010). Using a Learning Management system to facilitate learning outcomes assessment. In Y. Kats (Ed.), *Learning management system technologies and software solutions for online teaching: Tools and applications* (pp. 138-156). Hershey, PA: Information Science Reference.

Teo, T. (2009). Modelling technology acceptance in education: A study of pre-service teachers. *Computers & Education*, *52*(2), 302–312.

Teo, T. (2010). Examining the influence of subjective norm and facilitating conditions on the intention to use technology among pre-service teachers: A structural equation modeling of an extended technology acceptance model. *Asia Pacific Education Review*, *11*(2), 253-262.

Teo, T., Lee, C. B., Chai, C. S., Choy, D. (2009). Modelling pre-service teachers' perceived usefulness of an ICT-based student-centered learning (SCL) curriculum: A Singapore study. *Asia Pacific Education Review*, *10*(4), 535-545.

Teo, T., Lee, C. B., Chai, C. S., & Wong, S. L. (2009). Assessing the intention to use technology among pre-service teachers in Singapore and Malaysia: A multigroup invariance analysis of the Technology Acceptance Model (TAM). *Computers & Education*, *53*(3), 1000–1009.

The 2002 campus computing survey. Campus portals make progress; Technology budgets suffer significant cuts. Retrieved May 2012 from: http://www.campuscomputing.net/2002-campus-computing-survey

The campus computing project (2012). Retrieved September 2013 from: http://w.w.w.campuscomputing.net/sites/www.campuscomputing.net/files/Green-CampusComputing2012.pdf.

The Malaysian Higher Education System-An Overview, Retrieved March 2013 from: http://w.w.w.studymalaysia.com/education/art_education.php?id=nationaledu2.

Theis, J. G.(2005). *Perceived learning and performance needs of organizations seeking a learning management system* (Doctoral dissertation, The University of Minnesota, USA). Retrieved from ProQuest Dissertations and Theses database. (UMI No 3167659)

Tinsley, H. E., & Tinsley, D. J. (1987). Users of factor analysis in counseling psychology research. *Journal of Counseling Psychology, 34*(4), 414-424.

Tsang, P., Cheung, S. K. S., Lee, V. S. K., & Huang, R. (Eds.). (2010). *Proceedings of hybrid learning: Third international conference, ICH*. Beijing: China.

United Nations Development Programme (2005). Regional human development report: Promoting ICT for human development in Asia: Realizing the millennium development goals. UNDP.

Urbach, N., Smolnik, S., & Riempp, G. (2010). An empirical investigation of employee portal success. *Journal of Strategic Information Systems, 19*(3), 184-206.

Vai, M., & Sosulski, K. (2011). *Essentials of online course design: A standards-based guide.* New York: Routledge.

Valtonen, T., Hacklin, S., Kontkanen, S., Hartikainen-Ahia, A., & Kärkkäinen, S., & Kukkonen, J.(2013). Pre-service teachers' experiences of using social software applications for collaborative inquiry. *Computers & Education, 69*, 85-95.

Van Raaij, E. M., & Schepers, J. J. L. (2008). The acceptance and use of a virtual learning environment in China. *Computers & Education*, *50*(3), 838–852.

Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research*, *11*(4), 342-365.

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, *39*(2), 273-315.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186-204.

Venkatesh, V., Morris, M., Davis, G., & Davis, F. (2003). User acceptance of information technology: Toward a unified View. *MIS Quarterly*, *27*(3), 425-478.

Venkatesh, V, Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, *36*(1), 157-178.

Wagner, A., Barbosa, J. L. V., Barbosa, D., N., F. (2014). A model for profile management applied to ubiquitous learning environments *Expert Systems with Application, 41*(4), 2023-2034.

Wang, Y. (2004). Distance language learning: Interactivity and fourth-generation Internet-based videoconferencing. *CALICO Journal*, *21*(2), 373-395.

Wang, Y., & Chen, N.-S. (2009). Criteria for evaluating synchronous learning management systems: Arguments from the distance language classroom. *Computer Assisted Language Learning*, *22*(1), 1-18.

Wang, W-T., & Wang, C-C. (2009). An empirical study of instructor adoption of web-based learning systems. *Computers & Education*, *53*(3), 761-774.

Wang, J., & Wang, X. (2012). *Structural equation modeling: Applications using Mplus*. West Sussex: Wiley.

Wankel, C. (2011). New dimensions of communicating with students: Introduction to teaching arts and science with the new social media. In C. Wankel (Ed.), *Cutting-edge technologies in higher education: Teaching arts and science with the new social media* (pp. 3-14). Bingley: Emerald Group Publishing.

Wen, M. L., Tsai, C-C., Lin, H-M., & Chuang, S-C. (2004). Cognitive-metacognitive and content-technical aspects of constructivist Internet-based learning environments: a LISREL analysis. *Computers & Education*, *43*(3), 237-248.

Werts, C.E., Linn, R.L., & Jöreskog, K.G. (1974). Intraclass reliability estimates: Testing structural assumptions. *Educational and Psychological Measurement*, *34*(1) 25-33.

West, J. A., & West, M. L. (2009). *Using wikis for online collaboration*: *The power of the read-write Web*. San Francisco, CA: Jossey-Bass.

West, S. G., & Taylor, A. B., & Wu, W. (2012). Model fit and model selection in structural equation modeling. In R. H. Hoyle (Ed.), *Handbook of structural equation modeling* (pp. 209-231). New York: Guilford Press.

Wilkinson, D., & Birmingham, P. (2003). *Using research instruments: A guide for researchers*. London: RoutlegeFalmer.

Yen, D. C., Wu, C-S., Cheng, F-F, & Huang, Y-W. (2010). Determinants of users' intention to adopt wireless technology: An empirical study by integrating TTF with TAM. *Computers in Human Behavior*, *26*(5), 906-915.

Yuen, A. H. K., & Ma, W. W. K. (2008). Exploring teacher acceptance of e-learning technology. *Asia-Pacific Journal of Teacher Education, 36*(3), 229-243.

Zakaria, M. H., Watson, J., & Edwards, S. L. (2010). Investigating the use of Web 2.0 technology by Malaysian students. *Multicultural Education & Technology Journal*, *4*(1), 17-29.

Zhou, T., Lu, Y., & Wang, B. (2010). Integrating TTF and UTAUT to explain mobile banking user adoption. *Computers in Human Behavior, 26*(4), 760-767.