UNIVERSITI PUTRA MALAYSIA

PREDICTING TECHNOLOGY UTILISATION OF LEARNING MANAGEMENT SYSTEM AMONG MALAYSIAN POLYTECHNIC STUDENTS

NORHAFIZAH ISMAIL

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By

NORHAFIZAH BINTI ISMAIL

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

December 2017

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DEDICATION

Bismillahirrohmanirrohim

This endeavor is dedicated to Allah S.W.T , The Prophet Muhammad SAW,
my beloved late father, Allahyarham Hj Ismail Ahmad,
beloved mother, Hjh Hatimah Hadirun,
kind and supportive husband, Nazid Sarji,
sweet daughter, Nurnazlah Fatnin Nazid,
true love siblings,
family members
and
friends.

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

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Chairperson : Associate Professor Ahmad Fauzi Bin Mohd Ayub, PhD
Faculty : Educational Studies

The major purpose of the current study is to identify the predicting factors, mediators and moderators towards effective technology use of Curriculum Information Document Online System (CIDOS) Learning Management System (LMS) among full-time undergraduate diploma students of Engineering Department at Malaysian Polytechnics. The theories underpinning this study are Theory Reasoned Action (TRA), Technology Acceptance Model (TAM), Substitution, Augmentation, Modification and Redefinition (SAMR) model and Adaptive Structuration Theory (AST). There are six predicting factors involved; compatibility, application self-efficacy, subjective norm, technological complexity, perceived usefulness and perceived ease of use. Technology utilisation is a dependent variable which encompasses of consistency of use, as well as quality of use. Genders and level of integration are the moderators, meanwhile perceived usefulness and perceive ease of use are classified as mediators.

A pilot test was implemented on 100 undergraduate technical students of Politeknik Merlimau, Melaka (PMM) to measure the research instrument's reliability. The value of Cronbach' s alpha obtained ranged from 0.828 to 0.933. For the measurement model, Confirmatory Factor Analysis (CFA) was required to test the consistency of construct and determine construct validity. The present study was carried out on 372 second-year students from five polytechnics of Malaysia (Premier and Conventional) including Politeknik Ungku Omar (PUO), Politeknik Sultan Salahuddin Abdul Aziz Shah (PSA), Politeknik Merlimau, Melaka (PMM), Politeknik Ibrahim Sultan (PIS) and Politeknik Port Dickson (PPD). The sampling technique used was two-stage cluster sampling.

The quantitative method with descriptive research was conducted by analysing the statistics of mean, standard deviation, percentage and frequency. The statistical analysis of Structural Equation Modelling (SEM), using AMOS Version 22, was utilised. Based on the measurement model testing, among the 10 paths, 9 were significant and only one was not. The 10 paths were: 1) compatibility positively effects perceived usefulness (β=.516, $p<0.001$); 2) application self-efficacy has no a significant effect on perceived usefulness (β=.105, $p>0.05$); 3) subjective norm positively effects perceived usefulness (β=.143, $p<0.05$); 4) technological complexity negatively effects perceived usefulness (β=-.165, $p<0.01$); 5) compatibility positively effects perceived ease of use (β=.322, $p<0.001$); 6) application self-efficacy positively effects perceived ease of use (β=.344, $p<0.001$); 7) subjective norm positively effects perceived ease of use (β=.158, $p<0.01$); 8) technological complexity negatively effects perceived ease of use (β=-.214, $p<0.001$); 9) perceived usefulness positively effects technology utilisation (β=.265, $p<0.001$); and 10) perceived ease of use positively effects technology utilisation (β=.343, $p<0.001$).

Based on the revised structural model, the main contribution for PU and PEOU was pertained to compatibility (β=.516, $p<.001$; β=.322, $p<.001$). The outcome of evaluation conceded that predictors TU could explain 67.7% of its variance. In the interim, the leading contribution was ASE (β=.344, $p<.001$) and followed by PEOU (β=.343, $p<.001$). The mediation test findings also revealed that among eight mediation tests, six were not supported (no mediation), and two met full mediation.

The findings of mediation test revealed that PU does not mediate the influence of C on PU; PU does not mediate the influence of ASE on TU; PU does not mediate the influence of SN on TU; PU does not mediate the influence of TC on TU; PEOU does not mediate the influence of C on TU; PEOU does mediate the influence of ASE on TU; PEOU does not mediate the influence of SN on TU and PEOU does mediate the influence of TC on TU. ASE fully mediates the influence of PEOU on TU and TC fully mediates the influence of PEOU on TU. Gender fully moderates the relationship between PU and TU since the standardized estimates for male is significant and female is not significant. Level of integration partially moderates the relationship PEOU and TU since the standardized estimates for Semester 3 and 4 are both significant.

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

PERAMALAN PENGGUNAAN TEKNOLOGI SISTEM PENGURUSAN PEMBELAJARAN DALAM KALANGAN PELAJAR POLITEKNIK MALAYSIA

Oleh

NORHAFIZAH BINTI ISMAIL

Disember 2017

Pengerusi : Profesor Madya Ahmad Fauzi Bin Mohd Ayub, PhD
Fakulti : Pengajian Pendidikan

Tujuan utama kajian semasa ini untuk mengenalpasti faktor-faktor peramal, pengantara dan penyederhana terhadap penggunaan Sistem Pengurusan Pembelajaran bagi Sistem Dokumen Maklumat Kurikulum Atas Talian (CIDOS) dalam kalangan pelajar sepenuh masa diploma di Jabatan Kejuruteraan, Politeknik Malaysia. Teori-teori yang terkandung dalam kajian ini ialah Teori Tindakan Beralasan (TRA), Model Penerimaan Teknologi (TAM), Penggantian, Pengukuhan, Pengubahsuaian dan Pentakrifan Semula Model (SAMR) dan Teori Penstrukturan Penyesuaian (AST). Terdapat enam faktor-faktor peramal termasuk; kesesuaian, keberkesanan kendiri aplikasi, norma subjektif, kompleksiti teknologi, tanggapan kebergunaan dan tanggapan keselesaan penggunaan. Penggunaan teknologi ialah pembolehubah bersandar merangkumi penggunaan secara konsisten dan kualiti penggunaan. Jantina dan peringkat integrasi adalah penyederhana, manakala , tanggapan kebergunaan dan tanggapan keselesaan penggunaan dikelasifikasi sebagai pengantara.

Kajian rintis telah dijalankan ke atas 100 pelajar teknikal peringkat diploma di Politeknik Merlimau, Melaka (PMM) untuk mengukur kebolehpercayaan instrumen kajian. Nilai alpha Cronbach yang diperolehi daripada 0.828 hingga 0.933. Bagi pengukuran model, Analisis Faktor Pengesahan (CFA) diperlukan untuk menguji konsistensi konstruk and menentukan kesahan konstruk. Kajian semasa telah dijalankan ke atas 372 pelajar Tahun Dua daripada lima buah politeknik di Malaysia (Premier dan Konvensional) termasuk Politeknik Ungku Omar (PUO), Politeknik Sultan Salahuddin Abdul Aziz Shah (PSA), Politeknik Merlimau, Melaka (PMM), Politeknik Ibrahim Sultan (PIS) dan Politeknik Port Dickson (PPD). Teknik persampelan yang digunakan adalah persampelan secara kelompok dua-peringkat.

Kaedah kuantitatif dengan kajian deskriptif telah dijalankan melalui analisis statistik min, sisihan piawai, peratus dan frekuensi. Analisis statistik Permodelan Persamaan Berstruktur (SEM), menggunakan AMOS Version 22, telah digunakan. Berdasarkan pengujian model pengukuran, daripada 10 laluan, 9 adalah signifikan dan 1 laluan tidak signifikan. Sepuluh laluan-laluan tersebut adalah: 1) kesesuaian memberi kesan signifikan secara positif terhadap tanggapan kebergunaan (β=.516, $p<0.001$); 2) keberkesanan kendiri aplikasi tidak memberi kesan signifikan secara positif terhadap tanggapan kebergunaan (β=.105, $p>0.05$); 3) norma subjektif memberi kesan signifikan secara positif terhadap tanggapan kebergunaan (β=.143, $p<0.05$); 4) kompleksiti teknologi memberi kesan signifikan secara negatif terhadap tanggapan kebergunaan (β=-.165, $p<0.01$); 5) kesesuaian memberi kesan signifikan secara positif terhadap tanggapan keselesaan penggunaan (β=.322, $p<0.001$); 6) keberkesanan kendiri aplikasi memberi kesan signifikan secara positif terhadap tanggapan keselesaan penggunaan (β=.344, $p<0.001$); 7) norma subjektif memberi kesan signifikan secara positif terhadap tanggapan keselesaan penggunaan (β=.158, $p<0.01$); 8) kompleksiti teknologi memberi kesan signifikan secara negatif terhadap tanggapan keselesaan penggunaan (β=-.214, $p<0.001$); 9) tanggapan kebergunaan memberi kesan signifikan secara positif terhadap penggunaan teknologi (β=.265, $p<0.001$); dan 10) tanggapan keselesaan penggunaan memberi kesan signifikan secara positif terhadap penggunaan teknologi (β=.343, $p<0.001$).

Berdasarkan model berstruktur yang disemak, sumbangan utama bagi PU dan PEOU telah dihasilkan oleh kesesuaian (β=.516, $p<.001$; β=.322, $p<.001$). Penilaian dapatan menunjukkan bahawa peramal-peramal TU telah menjelaskan 67.7% daripada nilai variannya. Di samping itu, sumbangan utama juga diperolehi daripada ASE (β=.344, $p<.001$) dan diikuti oleh PEOU (β=.343, $p<.001$). Keputusan pengujian pengantara juga mendapati daripada lapan ujian pengantara, enam adalah tidak menyokong (tiada pengantara), dan dua mempunyai pengantara secara penuh. Hasil keputusan ujian penyederhana mendapati bahawa PU tidak menjadi pengantara pengaruh C terhadap TU; PU tidak menjadi pengantara pengaruh ASE terhadap TU; PU tidak menjadi pengantara pengaruh SN terhadap TU; PU tidak menjadi pengantara pengaruh TC terhadap TU; PEOU tidak menjadi pengantara pengaruh C terhadap TU; PEOU menjadi pengantara pengaruh ASE terhadap TU; PEOU tidak menjadi pengantara pengaruh SN terhadap TU dan PEOU menjadi pengantara pengaruh TC terhadap TU. PEOU menjadi pengantara secara penuh pengaruh ASE terhadap TU dan PEOU menjadi pengantara secara penuh pengaruh TC terhadap TU. Jantina menjadi penyederhana secara penuh bagi hubungan antara PU dan TU kerana anggaran piawai bagi lelaki adalah signifikan dan perempuan adalah tidak signifikan. Peringkat integrasi menjadi penyederhana secara separa bagi hubungan antara PEOU dan TU kerana anggaran piawai bagi Semester 3 dan 4 adalah signifikan.

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

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LIST OF ABBREVIATIONS

AGFI	Adjusted Goodness of Fit Indicator
ASE	Application Self-Efficacy
AST	Adaptive Structuration Theory
BC	Bias Corrected
BIPD	Bahagian Instruksional dan Pembelajaran Digital
BIU	Behaviour Intention Use
BL	Blended Learning
BLX	Blended Learning Index
BPK	Bahagian Pembangunan Kurikulum
BPP	Bahagian Peperiksaan dan Penilaian
C	Compatibility
CALC	Centre for the Advancement of Language Competence
CeL	College E-Learning System
CeLT	Center for e-Learning and Teaching
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CIDOS	Curriculum Information Document System
CMC	Computer Mediated Communication
CMS	Course Management System
COP	Community of Practice
CSE	Computer Self-Efficacy
DePAN	Dasar e-Pembelajaran Negara
DPCCE	Department of Polytechnic and Community College Education
ESL	English-as-a-Second-Language
ET/LS	Electronic Teaching Learning System
FC	Facilitations Conditions
FMS	File Management System
FOSEL	French on Online Specific Objectives
FtF	Face-to-Face
GDSS	Group Decision Support Systems
GFI	Goodness of Fit Indicator
GPS	Global Positioning System
GSS	Group Support Systems

HEIs	Higher Education Institutions
ICT	Information Communication Technology
IHL	Institution of Higher Learning
ILKA	Institut Latihan Kemahiran Awam
IS	Information Systems
JISC	Joint Information Systems Committee
JPP	Jabatan Pendidikan Politeknik
KMS	Knowledge Management System
KPT	Kementerian Pendidikan Tinggi
LMS	Learning Management System
METrO	Maximising Education & Training Opportunities
METU	Middle East Technical University
MOE	Ministry of Education
MOHE	Ministry of Higher Education
MI	Mobile Internet
MIS	Management Information Systems
MSC	Multimedia Super Corridor
MQA	Malaysian Qualification Agency
MTUN	Malaysian Technical University Network
NFI	Normed Fit Index
OS	Organisational Support
OSS	Open Source Systems
ODL	Open and Distance Learning
OER	Open Educational Resource
OLR	Online Library Reference
ORI	Open Resource Initiative
PAH	Pedagogy, Andragogy and Heutagogy
PBL	Problem-Based Learning
PC	Personal Computing
PE	Prior Experience
PEOU	Perceived Ease of Use
PKS	Politeknik Kuching Sarawak
PLO	Program Learning Outcome
PLS	Partial Least Square
PMJ	Politeknik Mersing Johor

PMK	Politeknik Melaka
PMM	Politeknik Merlimau Melaka
PMS	Politeknik Mukah Sarawak
PIS	Politeknik Ibrahim Sultan
PPD	Politeknik Port Dickson
PPIP	Pusat Penyelidikan dan Inovasi Politeknik
PSA	Politeknik Sultan Salahuddin Abdul Aziz Shah
PSE	Perceived Self-Efficacy
PSP	Politeknik Seberang Perai
PTSB	Politeknik Tuanku Sultanah Bahiyah, Kulim
PU	Public University
PU	Perceived Usefulness
PUO	Politeknik Ungku Omar
RMSEA	Root Mean Square Error of Approximation
SAMR	Substitution, Augmentation, Modification and Redefinition
SB	Smart White Board
SCL	Student Centered Learning
SCORM	Shareable Content Object Reference Model
SLT	Student Learning Time
SMS	Short Message Services
SN	Subjective Norm
SNSs	Social Network Sites
SNTs	Social Networking Technologies
SEM	Structural Equation Modeling
SIRIM	Standards and Industrial Research Institute of Malaysia
SPM	Sijil Pelajaran Malaysia
SQ	System Quality
TAM	Technology Acceptance Model
TC	Technological Complexity
TE	Task Equivocality
TLA	Teaching and Learning Activities
TLI	Tucker-Lewis Index
TML	Technology Mediated Learning
TPB	Theory Plan Behaviour
TRA	Theory of Reasoned Action

TTF	Task-Technology Fit
TU	Technology Utilisation
T&L	Teaching and Learning
TVET	Technical, Vocational, Educational and Training
UKM	Universiti Kebangsaan Malaysia
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPM	Universiti Putra Malaysia
URL	Uniform Resource Locator
UTAUT	Unified Theory of Acceptance and Use of Technology
UTM	Universiti Teknologi Malaysia
UUM	Universiti Utara Malaysia
VLE	Virtual Learning Environment
WIMD	Wireless Internet via Mobile Device
WWW	World Wide Web

CHAPTER 1

INTRODUCTION

1.1 Background

In the current years, Information and Communication Technology (ICT) has grown tremendously that it requires the educational entities to apply instructional technology as a tool, specifically electronic tool (Roblyer & Doering, 2010). Similarly, effort to incorporate ICT in educational system is imperative (Fernandez, 2013). The facilities, including blogs, are vital learning platforms to stimulate techno-savvy learners and problem solving skills in collaborative environment (Kwok & Neo, 2015). Furthermore, students prefer to widely employ ICT facilities in Web 2.0 such as Twitter, Facebook, Prezi, Youtube, as well as WordPress, that promise clear instructional technology for pre-service teachers in the subsequent lecture mode (Hamdan, Din, Abdul Manaf, Mat Salleh, Kamsin, & Ismail, 2015). Hence, effort to incorporate instructional technology like training and support of policy makers, as alternative mechanisms in teaching and learning, is required to enhance ICT use effectively (Archer, Savage, Sanghera-Sidhu, Wood, Gottardo, & Chen, 2014).

The purpose of ICT and Web 2.0 is to provide significant potential on educational process by facilitating inquiry, literacies, publication and collaboration (Ferguson, Faulkner, Whitelock, & Sheehy, 2014). Complementary to these, the process of augmenting educational access and its features can be implemented through ICT. From the context of meaningful learning, Web 2.0 has been used to encourage active learning and give significant impacts in learning process (Hamdan *et al*., 2015). Previous research involving Web 2.0 has highlighted the experiences in evaluating the assignment and provided advantages and challenges to increase students' performance, literacy outcomes and learning concentration (Williams & Chinn, 2009). The perceived enjoyment in using Web 2.0 among participants has enthralled session of teaching internship in communication technology course (Kim & Jang, 2015). This experience has indicated improvement in students' motivation, as well as effectiveness in group work and technology integration competence in the existing curriculum. Hence, Web 2.0 tools are useful applications to produce excellent networking and strengthen collaborative efforts and meaningful experiences.

One of the well-known recognitions of ICT is as a mechanism to foster the strength, capability of teaching, as well as boost students' knowledge (Moses, Khambari, & Luan, 2008; Luan, Atan, & Sabudin, 2010; Afshari, Bakar, Luan, Samah, & Fooi, 2008). In order to bring significant transformation into learning surroundings,

computer technology has performed as a tremendous and influential device. Obviously, this technology generates improvement, provides added value and inculcates students' motivation to pursue learning in educational environment (Fridin, 2014). ICT has been highlighted in the speech of the former Malaysian Education Minister, Tan Sri Muhyiddin Yassin, during the event of Digital Education Show Asia. As a responsible net citizen in Malaysia, digital literacy is vital as it involves ethical issues. In addition, the announcement made about the establishment of 7,000 additional WiMax Tower, together with 3,000 more in the near future, provides benefits to the schools that have 7 000 from 4G Virtual Learning Environment (VLE). This shows a positive influence in the arena of national education ICT.

The Learning Management System (LMS) delivery method was introduced in the early 1990s (Coates *et al*., 2005). Since the implementation, it has provided beneficial in an educational setting, with many educational institutions are taking the opportunity to increase the usage of the system (Islam, 2013). Likewise, the management team needs to plan various strategies when LMS is selected as one of the teaching delivery methods. In recent years, LMS becomes a preferred and famous application in Higher Education Institutions (HEIs) due to its high valuable implications (Álvarez, Martín, Fernández Castro, & Urretavizcaya, 2013; Dutta, Roy, & Seetharaman, 2013; Islam, 2013). Among other, LMS is used in hybrid learning surroundings to integrate collaborative and interactive learning activities (Dias & Diniz, 2014).

In addition, it is implemented with strong institutional support as well as sociocultural effort from various stakeholders. In order to access learning contents, web-based LMS is deployed (Nagy, 2016). In order to promote students' engagement, self-regulated and self-directed learning, attempting an effective communication management is required in distance learning setting. This management entails two components, namely, communication practice and communication tools (Kayode & Hashim, 2014). The first component involves communication practices via interactive tools and contents such as electronic mails, chats and video conferencing, quizzes, Problem-Based Learning (PBL) questions and response. Meanwhile, the latter entails LMS which performs as a communication tool, fosters students' autonomy, involvement, interactions and enthusiasm. Furthermore, new LMS systems have generated an active education, according to the read-write web.

In this context, some vital facilities such as chat, forum, wiki, downloading and uploading, e-portfolio and teamwork have been employed. The emergence of OSS (Open Source Systems) has changed the present situation and it continues to become commercialised system in an educational market (Babo & Azevedo, 2012; Jenkins *et al*., 2011; Arroway *et al*., 2010; Davis *et al*., 2009; Wheeler, 2004; Bradley *et al*., 2007). In Malaysia, the Ministry of Higher Education is committed in the implementation of new media technologies into academic activity. Among other, *Dasar e-Pembelajaran Negara* (DePAN) was introduced to provide quality and appropriate e-learning framework to develop world-class human capital, especially in

ICT and education services (DePAN, 2010). As a national e-learning policy, it was built to yield quality and flexible learning strategies among educational entities. Then again, it moulds the public and private university graduates to be competitive and collaborative in the global context.

In the past decade, Malaysia has spent more than RM6 billion on ICT including Smart Schools initiative (Abdullah, 2006; MSC, 2010a). The rest of the ICT programmes are related to Smart School's education courseware (Halim, Zain, Luan, & Atan, 2005), as well as instructor course and professional training (Shaharuddin & Abiddin, 2009). However, 80% of the instructors spend no more than an hour a week employing ICT (MOE, 2010). Furthermore, ICT is only used in academic session only for word-processing applications even though it has excellent potential to enhance the range of knowledge and thinking skills (UNESCO, 2012) and provide significant roles in the new technology integration in education (MOE, 2007a, 2007b; MOE, 2012a, 2012b; MSC, 2005 & MSC 2010a). In order to integrate ICT, the instructors ought to be assertive and not be complacent with the technology introduced in their teaching. For this purpose, they need to put a lot of effort to learn how to use the hardware and software required in the educational institution (Ali, Nor, Hamzah, & Alwi, 2009). Therefore, an outstanding integration of the new media technology in education is affected by institution's policy and instructors' knowledge and capability of this media tool (Ismail, 2015).

The implementation of ICT in the effort of enhancing learning quality across Malaysia has been started to provide virtual learning surrounding and internet access through 1BestariNet programme that includes 10,000 schools. Besides, it augments online excellent practices and contents such as video library of the best instructors delivering lessons for distance and self-paced education (DePAN, 2010). In Malaysia, there are three major ICT policies as highlighted by the Ministry of Education; ICT for all students, the role of ICT as educational tool and utilisation of ICT to enhance productivity, efficiency and effectiveness (UNESCO, 2003). Similarly, based on the Ninth Malaysia Plan in 2006-2010, the effort to bring the country into a division educational focal point was done in order to build smart public-private cooperation (Kaur *et al*., 2008, p. 1). Pre-service teachers need imperative skills to boost the quality of their delivery method and increase way of managing the information gained. The knowledge and skills can be grasped by utilising the ICT in such educational environment to obtain meaningful practice for career development (Baleghi-Zadeh, Ayub, Mahmud, & Daud, 2014).

In 1996, the first effort to introduce the LMS approach started with Malaysian Public Universities (Puteh, 2007). To begin with, the teaching and learning sessions were conducted with a few subjects. Nowadays, the strengthened strategies are still continued by Malaysian universities using their own management and approach (Ayub, Tarmizi, Jaafar, Ali, & Luan, 2010; Lee, Chan, Thanimalay, & Lim, 2012). In addition, the full participation of users in LMS, which entails specifically the interaction and communication between students and lectures, is important during the learning sessions. Motivating learners using an e-learning platform (SPeCTRUM) has since become a major factor. This participation is called co-participatory

activities (Ghavifekr & Mahmood, 2015). The intention of using SPeCTRUM as LMS requires a collaborative process to ensure continuous involvement. In order to assess technology success of LMS, Accuosti (2014) emphasised a few determining factors for effective educational technology utilisation in the recent research. These include teachers' requirements, technology materials and functions, students' needs and social environment.

1.2 LMS in Higher Education

The growth of Web 2.0 technology such as LMS Moodle under blended learning context provides promising rich education surroundings and influences the attitude of users' interaction (Dias & Diniz, 2013). Active learning surroundings in Web 2.0 encourage students to contribute ideas and provide quick responses of learning material. Although conventional learning methodology is still a major delivery format, many educational institutions have widely been equipped with the LMS application in the last few years. It performs as a platform of education, web portal, content management system and course management system (Piotrowski, 2010).

By using the LMS, educators have flexibility and convenience to produce online lecture materials for their students. Although this can be done regardless of the geographical areas and time factor, technique to release the materials should be carefully considered (Poon, 2013). From the context of HEI, a research on LMS projects by Lyashenko and Frolova (2014) revealed an effective and useful platform of intergenerational e-learning. Besides, it enhances higher education institution educators' ICT competency. The technology use in LMS projects stimulates the intergenerational learning collaboration as it provides training sessions and this proves that the product has the potential to become an outstanding virtual platform.

In the Malaysian context, institutions of higher learning are required to consider on the feasibility and compatibility of LMSs due to the fact that the educational system mainly involves in core business of teaching and learning (Embi, 2011; Embi, Hamat & Sulaiman, 2012). Similarly, HEI needs to narrow down the attention to elements of mechanical learning like assessment and technique of content delivery. The central theme of LMS specification needs to be clearly described as it is a vital part to energise and actuate creative learning and knowledge transfer. The content delivery of online courses in HEI using own computers (94.2%) and the network of campus wireless (63.7%) indicated as necessary of access to LMS method (Embi & Adun, 2010).

In 2009, LMS was used at Limkokwing University as an essential platform to convey learning materials, track the students' achievement and financial matters. Specification of LMS covers the use of electronic library in order to gain advance information in learning (Salem & Salem, 2015). Research conducted at Universiti Utara Malaysia (UUM) has indicated that LMS compatibility is essential for course

contents such as for retrieving and viewing, and continuous interactions. Nonetheless, support of helpdesks, stabilised linking to important hubs is still not commonly used among undergraduates (Sam, 2015). The e-learning acceptance and satisfaction studies at Universiti Teknologi Malaysia (UTM) encompass a virtual platform to upload notes, slides and learning tasks in order to activate e-discussion and knowledge-sharing activities in interactive surroundings (Masrom, 2007; Razak, 2010). More importantly, the type of instructional technology used has influenced the teaching and learning strategies in the LMS environment. Meanwhile, Polytechnic students preferred utilising ICT applications like online lectures, computer simulations, audio and video streaming, as well as Power Point presentations (Kumar, Muniandy, & Yahya, 2014).

The design of LMS, such as Blackboard and Moodle, was developed based on educational settings (Abdelhakim, & Shirmohammadi, 2008; Terawaki, 2009). It has major elements in decision support models that focus on internet functional and technical requirements. Black *et al*. (2007) identified LMS as appropriate and consistent products that cover universal mechanisms like e-quizzes, e-assessment, active interactions and association spaces. Furthermore, LMS implementation encourages the essential process of decision-making in peer organisations' case studies. As a conclusion, more efforts ought to be taken to stimulate wider adoption of ICT in the teaching and learning component.

LMS provides tools to communicate among users whether in or out of campus. Tools such as forum, e-assignment and e-content enhance the features to enthral active learning. Previous research by Salam, Mohamad, Bakar and Sui (2014) emphasised that Polytechnic students have good strength in visual-spatial and verbal-linguistic intelligences. Activities in LMS need to consider online multiple intelligence (MI) teaching activities. The issue focused on assisting educators to develop self-education materials to accomplish impressive Teaching and Learning (T&L) session will ensure consistent usage and continuous interactions between lecturers and students. Most importantly, the existing LMS services (Hamat, Embi, & Sulaiman, 2011; Pérez, Menéndez, Gutiérrez, Rosário, Alba, & Fernández, 2011) can be classified into two types. The first category is open-source, which can be downloaded freely by anyone. Meanwhile, commercial is the second category which normally comes with high cost (Perez *et al*., 2011). Malaysian Polytechnics have their own LMS known as CIDOS (Curriculum Information Document Online System). It was developed by the Department of Polytechnic Education to increase the number of users adopting this technology mediated learning. Nevertheless, several studies have indicated that educational entities are not consistently used and involvement in technologies and IT usage is still generally low (Chiu *et al*., 2005; Klobas & McGill, 2010; Osang, Abinwi, & Tsuma, 2015).

1.3 LMS Adoption

Technology adoption can be referred as a process of ICT mediated teaching and learning system acceptance among educational society (Wu & Liu, 2013). Similarly,

the process involves students, instructors, as well as teaching materials, during the academic sessions. Past researches have highlighted that cognitive style fairly moderates the implications of ease of use on technology adoption behaviour for analytical-typed subjects. In particular, it continues to deploy facilities such as discussion forum to foster interactive acquisition of knowledge and support the animation development as teaching tools (Chen & Li, 2010; Wu *et al*., 2010).

The preference over advanced ICT has opened the potential of LMS adoption in education. It is exciting to apply innovation materials and techniques like game-based learning system (Paraskeva *et al*., 2010) in an interesting environment and assist the flow of teaching and learning (Owston *et al*., 2009). Hence, playfulness becomes a predictor of innovation technology use through interactions of human-computer (Owston *et al*., 2009; Paraskeva *et al*., 2010; Bertacchini *et al*., 2012). Recent research of Islam (2013) revealed the findings of 48.2% users in education using mobile LMS. Meanwhile, almost 80% applied mobile devices. Technology devices are handy and easily grasped by youngsters. According to Eow, Wan Ali, Mahmud, and Baki (2009), children at the age of thirteen have already acquired knowledge about and experiences with digital media in their learning situation. In addition, engaging surroundings are noticeable factors in encouraging technology digital media use in LMS adoption.

However, non-users of mobile LMS have a different viewpoint. Complexity and resistance are factors of failure in adopting the mobile LMS (Wu, Wu, Chen, Kao, Lin, & Huang, 2012). In addition, instructors do not utilise the features of LMS much due to certain characteristics of instructor's interactions which entail time, knowledge, infrastructure, skills, interest and procedures (Hashim & Hisyam, 2006). The interactive innovations such as online instructional strategies, content, time, interest, facilities, knowledge and skills also determine the LMS adoption among students. In the context of teaching practices, the academic staff in Community College have been exposed to instructional design and recommendations to improve technology adoption in the classroom by the institution (Azlim, Amran, & Rusli, 2015). Nevertheless, the relevant infrastructures such as the internet, computer technology and technical foundation need to be provided appropriately.

The establishment of Department of Polytechnic and Community College Education (DPCCE) in 2004 has formed an imperative role to support government policies. It has been monitored by the Ministry of Higher Education (MOHE) to produce improved teaching and learning delivery and set up an impressive nation that is embedded in knowledge, culture and civilization in the context of higher education sector. After the transformation and re-branding of Technical Vocational Education Training (TVET), within five years beginning from 16th September 2009, two different departments have been established; Department of Polytechnic Education and Department of Community College Education. In this phase, the objectives were narrowed down to yield innovative and foster employability among graduates. The unit of Curriculum Department and Evaluation is responsible to perform as web-based solution and it was developed particularly for the needs of curriculum inventory, tools of educational and knowledge sharing (Ahmad *et al*., 2010). Equally

pertinent is the facilities related to discussion forum, chat, uploading academic materials and monitoring students' progress. Meanwhile, the emergence of LMS, which is known as CIDOS in Malaysian Polytechnic, has influenced the strategies of teaching and learning. Recently, platform of CIDOS e-Learning Version 2.5 has assisted blended learning in the context of internet support at Politeknik Kuching Sarawak (PKS) (Harun, Majalis, & Mohamed, 2015).

In the same way, the mutual effort from the Polytechnic administration is crucial to enhance students' skills and knowledge with LMS adoption. A research conducted at Politeknik Ungku Omar (PUO) and Politeknik Seberang Perai (PSP) revealed only 51.8% of the respondents were employing CIDOS as the teaching and learning platform (Mohamad, Salam, & Bakar, 2014). Therefore, the success of LMS implementation and adoption is closely related with good time-management of academic staff in preparing teaching materials, supportive surroundings, proactive teamwork, collaborative efforts and user-friendly interface.

1.4 Statement of the Problem

Rapid rise of technology has altered the way people gain skills (Leonard, & Delacey, 2002). Adoption of LMS as universal web technology has transformed education with high solution package (Al-Busaidi, 2013; Hustad & Arntzen, 2013; Ward & Parr, 2010; Wall & Ahmed, 2008; Breiter, 2004). Nonetheless, it lacks management of course contents (Salem & Salem, 2015). Although users' attitude and environment (Asiri, Mahmud, Bakar & Mohd Ayub, 2012) emphasise progress of learning purposes, there is a lack in monitoring of LMS implementation (Aydin & McIsaac, 2004; Motaghian *et al*., 2013; Sahin, 2011). The ineffective levels of technology use (Adiguzel, 2010; Aksit, 2007), lack of attractive environment and quality system embeds troublesome (Liao & Liu, 2012). Moreover, Gwebu and Wang (2011), Jaschik, Lederman and Gallup (2014) and McGill, Klobas, and Renzi (2011) stated the limited use among instructors and lack of standard technology interfaces. The discontinuity of interactions prolongs inconsistency and decreases quality of use among students. Some lecturers failed to utilise it completely (Coskuncay & Ozkan, 2013; Graf *et al*., 2009; Fuller, Hardin, & Davison, 2006; Wang, & Wang, 2009). LMS endures from drawbacks of technology complexity including time consuming and lack of openness to adapt materials (Allen, 2011; Dodd & Antonenko, 2012; García-Peñalvo *et al*., 2011; Al Khalifa, 2010a).

Statistics indicates only 70% make it compulsory in their academic sessions (Embi, 2011) even though they have fostered it (Subramaniam *et al*., 2013). A lot of expenses is needed to equip with modern technology (Naveh, Tubin, & Pliskin, 2010; Islam, 2013) but it has not been used effectively and consistently. For instance, e-Learning@UTM, PutraLMS and College E-Learning System (CeL) are deployed to monitor university-broad courses, yet there are constraints to revise uploaded files and edit digital documents (Universiti Teknologi Malaysia, 2014; Universiti Putra Malaysia, 2014; Tunku Abdul Rahman University College, 2014). The actual problems within Malaysian context are inconsistency of use (Razali & Shahbodin, 2014; Zaihasrina, 2012) and difficulties to assess the quality of use of Learning

Management System (LMS) (CIDOS Users' Manual Version 2.5, 2015; Zainal Abidin, 2014). These problems yield constraints to technology utilisation among undergraduate engineering learners. The research gap relates to ineffective practice of LMS adoptions among Malaysian polytechnics' Year Two technical learners since the programmes are hands-on in essence. The main issues encompass factors of compatibility, application self-efficacy, subjective norm and technological complexity. Continuous participation is vital for students to achieve high skills (Nurul, Mohamad, Salam, & Bakar, 2014; Romli, 2013). CIDOS LMS Version 2.5 faces problem to detect the name of main instructors who handle the enrolled team-teaching classroom (CIDOS Users' Manual Version 2.5, 2015; Zainal Abidin, 2014). Moreover, it cannot load Shareable Content Object Reference (SCORM) content and perform back-up files for students transfer case (Razali & Shahbodin, 2014; Zainal Abidin, 2014). The quality of use in LMS still does not meet the targets set even though there are many courses supported by it. This is very worrying and the issue should be resolved in a more transparent way. The role of perceived usefulness (PU) and perceived ease of use (PEOU) as mediators as well as level of integration (LoI) and gender as moderators are other imperative issues require to embark in this study. Nonetheless, in depth investigation is required to identify the factors of LMS adoption among technical students in Malaysian Polytechnics. Technology Acceptance Model (TAM) which is based on Theory of Reason Action (TRA) yields a popular model is used to measure technology utilisation (Davis et al., 1989). As a guideline to integrate value of education via ICT, SAMR is selected to strengthen learning experience to gain the highest attainable (Puentedura, 2012). Adaptive Structuration Theory (AST) is another theory used to accommodate decision making towards IS utilisation (DeSanctis & Poole, 1994). Thus, it is pertinent to determine the factors that influence students' adoption of LMS to help administrators on broadening the practice of e-learning in Malaysian Polytechnic institutions.

1.5 Objectives of the Study

The objectives of this study are:

i. To determine the effects of compatibility, application self-efficacy, subjective norm and technology complexity on perceived usefulness among undergraduate technical students.

ii. To determine the effects of compatibility, application self-efficacy, subjective norm and technological complexity on perceived ease of use among undergraduate technical students.

iii. To determine the effects of perceived usefulness and perceived ease of use on technology utilisation among undergraduate technical students.

iv. To identify the role of perceived usefulness and perceived ease of use as mediators between LMS adoption and technology utilisation.

v. To identify the role of gender and level of integration as moderators on technology utilisation among undergraduate technical students.

vi. To develop a model to predict technology utilisation of LMS among undergraduate technical students.

1.6 Research Questions

Based on the purpose and objectives explained above, the specific research questions entailed are as follows:

i. What are the effects of compatibility, application self-efficacy, subjective norm and technology complexity, perceived usefulness, perceived ease of use and technology utilisation?

1.7 Research Hypotheses

Based on the research objectives, the related hypotheses are as follows:

Objective 1
To determine the effects of compatibility, application self-efficacy, subjective norm and technology complexity on perceived usefulness among undergraduate technical students.

H_1: Compatibility (C) has a significant positive effect on perceived usefulness (PU).
H_2: Application Self-Efficacy (ASE) has a significant positive effect on perceived usefulness (PU).
H_3: Subjective Norm (SN) has a significant positive effect on perceived usefulness (PU).
H_4: Technological Complexity (TC) has a significant positive effect on perceived usefulness (PU).

Objective 2
To determine the effects of compatibility, application self-efficacy, subjective norm and technological complexity on perceived ease of use among undergraduate technical students.

H_5: Compatibility (C) has a significant positive effect on perceived ease of use (PEOU).

H_6: Application Self-Efficacy (ASE) has a significant positive effect on perceived ease of use (PEOU).
H_7: Subjective Norm (SN) has a significant positive effect on perceived ease of use (PEOU).
H_8: Technological Complexity (TC) has a significant positive effect on perceived ease of use (PEOU).

Objective 3
To determine the effects of perceived usefulness and perceived ease of use on technology utilisation among undergraduate technical students

H_9: Perceived Usefulness (PU) has a significant positive effect on Technology Utilisation (TU).
H_{10}: Perceived Ease of Use (PEOU) has a significant positive effect on Technology Utilisation (TU).

Objective 4
To determine the roles of perceived usefulness and perceived ease of use as mediators between LMS adoption and technology utilisation

H_{11}: Perceived usefulness (PU) mediates the influence of Compatibility (C) on technology utilisation (TU)
H_{12}: Perceived usefulness (PU) mediates the influence of Application Self-Efficacy (ASE) on technology utilisation (TU)
H_{13}: Perceived usefulness (PU) mediates the influence of subjective norm (SN) on technology utilisation (TU)
H_{14}: Perceived usefulness (PU) mediates the influence of technological complexity (TC) on technology utilisation (TU)
H_{15}: Perceived ease of use (PEOU) mediates the influence of compatibility (C) on technology utilisation (TU)
H_{16}: Perceived ease of use (PEOU) mediates the influence of application self-efficacy (ASE) on technology utilisation (TU)
H_{17}: Perceived ease of use (PEOU) mediates Subject Norm (SN) on technology utilisation (TU)
H_{18}: Perceived ease of use (PEOU) mediates the influence of Technological Complexity (TC) on technology utilisation (TU)

Objective 5
To determine the roles of gender and level of integration as moderators for technology utilisation among undergraduate technical students

H_{19}: Gender moderates the influence of Perceived usefulness (PU) on technology utilisation (TU)
H_{20}: Level of Integration moderates the influence of Perceived ease of use (PEOU)

on technology utilisation (TU).

Objective 6
To develop a model to predict the factors that can lead to technology utilisation of LMS among undergraduate technical students.

1.8 Scope, Delimitation and Limitations of the Study

There are different types of Polytechnic institutions, yet this study is scoped to determine the Premier and Conventional polytechnic institutions. In this situation, it was limited to Year Two undergraduate technical students from background of civil, electrical and mechanical engineering.

1.8.1 Delimitation

Initially, this study will collect data related to predicting the technology utilisation of LMS. Technical students use digital material, forum session and e-assessment via LMS, which refers to Curriculum Information Document Online System (CIDOS), during their learning sessions. The instructors of engineering courses will monitor their activities, embolden to keep engaging in the blended learning environment and examine their tasks which are to be completed within one academic semester.

Furthermore, the factors affecting LMS adoption and technology utilisation among undergraduate technical students will be measured. The elements of technology utilisation for the three courses consist of consistency of use and quality of use. Meanwhile, belief factors such as PU and PEOU are the mediators, as well as gender and integration, will also be determined in this research. Moreover, the institutions' population will entail 3,570 students in Premier and Conventional Malaysian Polytechnics that offer engineering courses at Politeknik Ungku Omar (PUO), Politeknik Sultan Salahuddin Abdul Aziz Shah (PSA), Politeknik Merlimau Melaka (PMM), Politeknik Ibrahim Sultan (PIS) and Politeknik Port Dickson (PPD). The courses are enrolled by students in their second year of engineering studies.

1.8.2 Limitations

The first limitation of LMS adoption approach relates to core attributes of the study; in this context, the contributions of traditional classrooms, problem solving activities and coaching/mentoring among instructors and students in lively face-to-face teaching and learning format will be analysed. As the LMS approach allows the

educational entities to embed the mixture of lively face-to-face interactions, it also enables the online mode which encompasses the methods through synchronous virtual collaboration, asynchronous virtual collaboration and self-paced asynchronous. The online media types selected include the category of text, websites, audio files and video files. LMS is deployed as a medium of online learning in the process of developing mind to engage and keep updated with academic materials and announcement. Secondly, this study will measure only the technology utilisation of second year engineering students in the Southern, Centre and Northern Regional Malaysian Polytechnics. The justifications for choosing the engineering field include: (1) the technical institutions focus on yielding competent, innovative, transformative and diligent engineering graduates in the future; and (2) Polytechnics are in the effort to improve and transform the curriculum structure as well as encourage Malaysian Sijil Penilaian Malaysia (SPM) leavers to choose Polytechnics as the place for their tertiary technical education.

The two-stage cluster sampling procedure was used in this research, and five (5) polytechnics, (PUO, PSA, PPD, PMM and PIS) out of 34 Malaysian Polytechnics were selected for this purpose. The population was divided into isolate groups. Since it entails broadly distributed geographical locations, this sort of sampling was included all units in the subgroup. The first stage involved the selection of southern region institution simple random sampling, and the second stage encompassed the selection of year one technical courses students. This study was not being generalisable to all areas of engineering programmes, except for those at the Southern, Northern and Central Region Polytechnics in Malaysia.

1.9 Significance of the Study

This study entails two types of significance, which are theoretical and practical. From the dimension of the theoretical aspect, the study provide a better understanding of Technology Acceptance Model (TAM) which consists of perceived usefulness and perceived ease of use as the belief factors. LMS adoption encourages integration of technology in different stages based on the Substitution, Augmentation, Modification and Redefinition (SAMR) model. Consistency and quality of use inculcate continuous engagement in LMS learning activities. Thus, it reinforces the Adaptive Structuration Theory (AST) implication to generate active role in adapting and structuring a significant practice in educational institution. Meanwhile, the practical significance involves benefits and meaningful influences towards educational attributes such as students, lecturers, polytechnics, government and private sectors. It entails education technology improvement, flexibility in pedagogical and techniques of assessment, variety of content delivery, as well as experience, knowledge and skill transfer.

1.9.1 Theoretical Significance

The revolution and application of LMS as technology adoption in technical education institution give significant impacts to the delivery method of materials in teaching and learning. From the theoretical view, the methods of delivery and application of learning material as references are closely related to the practice of instructional design process. In this regard, the rapid emergence of technology in educational system has recently fostered knowledge enrichment (Davies, Hewege & Perera, 2013). With this development, it yields positive impact, particularly in assisting students' learning transfer, practising enhancement of Student Centred Learning (SCL) and self-exploratory to embolden learning engagement and effective technology use (Demirer, Bozoglan & Sahin, 2013). The recent discussions in technical institution of higher learning are on the implementation of LMS that entails the use of forum, digital material, e-content and e-assessment. Despite the fact that there are several studies carried out on technology adoption, various researches from diverse perspectives are still required. Nevertheless, some researchers have previously included students' performance and satisfaction of LMS adoption in their work. This study fills in the gap in the literature by researching on the consistency and quality of use with continuous usage of e-assessment, digital material and learning tools among diverse subjects taking technical courses. Hence, it is hoped to help knowledge enrichment through systematic monitoring in quality of use. More importantly, the elements of service, information and system implementation are important to ensure this enrichment can be done on LMS adoption in higher educational system.

Generally, most studies of technology adoption involved various subjects and the implementation of technology, utilisation and appropriateness that lead to enrichment of Technology Acceptance Model (TAM), Substitution, Augmentation, Modification and Redefinition (SAMR) Model and Adaptive Structuration Theory (AST). The theory encompasses knowledge which can be generated from the utilisation of technology. This enrichment includes cumulative understanding of transfer of experience that will become knowledge. Eventually, it is crucial to take into consideration active experimentation of knowledge application for continuous forthcoming usage.

Since it has been employed in certain institutions with the establishment of ICT infrastructure, it is necessary to investigate the strengths and consequences of LMS adoption approach embedded with predicting factors on effective technology use. It is imperative to measure the consistency of use, which basically comprises of continuous intention to employ LMS as technology adoption (Bhattacherjee, 2001).
Thus, this research attempts to make theoretical contributions to the analysis of technology utilisation, specifically in terms of quality of use on desired attributes such as system, information and service (Fathema, Shannon, & Ross, 2015; Pituch & Lee, 2006; Roca *et al*., 2006). The adoption of LMS also enhances features of usability, availability, reliability, adaptability and response time of LMS (Delone & Mclean, 2003).

It is hoped that the research will add to the body of knowledge on LMS adoption and implementation in various technical courses. In order to encourage effective learning via LMS among undergraduates, it is pertinent to take into consideration the functions, speed, features, contents and interaction capability of LMS. The value of LMS perceived quality of use will depict the knowledge, skill and transformation of technology adoption in online and face-to-face formats.

1.9.2 Practical Significance

Based on the existing element of related literature, efforts to encourage LMS adoption among Technical, Vocational, Educational and Training (TVET) institutions in Malaysia in relation to the consistency and quality of use are practically still few. Thus, they need to be investigated. The research should measure Malaysian Polytechnic students' perception of technology utilisation in their enrolled courses. With the rapid growth of technology and instructional system design implemented via LMS, this study focuses on effective technology use gained throughout the LMS adoption to predict factors with the additional belief factors acquired. From the research findings, this study will be beneficial to determining the facilitators' attempts and grasping the learners' interest in their learning materials. Hence, technology adoption will improve the teaching and learning delivery skills. The improvement is implemented through enrichment of digital materials and a variety of learning tools such as e-contents, forums, lecture notes and game-based activities. Moreover, the implementation of security features, unique access authorisation and specific learning object options produce a more systematic strategy in the instructional system design surrounding the LMS.

Recently, technology adoption provides dramatic impacts to the trends in learning environment and information technology of an educational system. The process of rethinking paradigm for LMS structures needs to take into account. It should enable modification of the ecosystem to embed diverse interactive educational events and improve facilitators' ICT tools for an outstanding achievement and satisfaction (Dias & Diniz, 2014).

This paradigm change will give positive chances to the new generation of learners in the effort to achieve excellent learning through the supported of digital presence, emboldened students negotiated projects with appropriate equipment and continuous educators' encouragement. It will give impacts on the institution of higher learning regardless of the courses, be it engineering or non-engineering course. The various methods used in accessing the learning materials allow for flexibility in the hybrid learning environments.

Based on the Malaysia Education Blue Print (2013), in order to scale up the quality of learning across Malaysia, the transformation shift is important. There are eleven shifts to transform the education system, and one of them is ICT usage. Thus, there is a need to maximise the use of ICT in education for distance and self-paced learning

and encourage more customised learning. LMS adoption applies ICT tools and this approach has been supported by the Ministry of Higher Education (MOHE) to sustain learning in the mode of lifelong learning. Exploring technology adoption supports Open Distance Learning (ODL) among adult learners. It converges educational tools and media for maximum learning and impacts on learners' performance. Besides, it is inviting, different, exciting and fun that draws enthusiasm and learning outcome to be measured. Hence, the study is crucial as it is an attempt to indicate the learners' perceived technology use based on Adaptive Structuration Theory and SAMR integration of technology model.

Furthermore, the benefits cover the contribution to the mixture of technology for learning purposes. When time and technology of education progress with new ideas and avenues in educators' approach, it gives significant impact towards fruitful learning as re-engineering ways of teaching and learning. As can be observed, it accommodates the learner's role to his or her other life roles, and hence, development of meaningful education programmes is crucial. The study explores the deployment of LMS; this includes face-to-face and online delivery formats. Furthermore, the significance in educational technology may change the way teaching and learning are done such as from the traditional, web facilitated, blended or hybrid and online learning. Even though this may show the new pattern in obtaining learning materials, the transformational assessment in the curriculum ought to be made applicable and it needs to be reviewed from time to time. This is to ensure the quality of the graduates with excellent learning outcomes and the best practical way as their learning experiences, and so does the recognition or accreditation of programme offered from the certified agency such as Standards and Industrial Research Institute of Malaysia (SIRIM) or Malaysian Qualification Agency (MQA).

The challenge, however, is to ensure that learning supported with technology adoption is sufficiently addressed in striving towards a better valuable consistency of use for students. Therefore, the upgrading effort in teaching practices with consideration of technology is important. This study seeks to understand the current practices of LMS in Malaysian Polytechnic and the effects on productive technology use. It is hoped to yield some solutions and good input for *Jabatan Pendidikan Politeknik* (JPP) or Polytechnic Education Department to provide a more systematic and organised structure of an appropriate LMS implementation.

1.10 Definition of Terms

Definition of terms is required in order to define the important terms used in this study. The definition will differentiate between the meaning of terms in a general understanding context and the research context that is carried out. As such, several pertinent terms are perceived usefulness, perceived ease of use, LMS adoption, compatibility, application self-efficacy, subjective norm, technology complexity, technology utilisation and level of integration.

1.10.1 Perceived Usefulness

Perceived usefulness refers to the degree to which an instructor believes that using a system will enhance process and outcome in learning or job performance (Davis, 1993; Chang & Tung, 2008). This study specifies perceived usefulness as the degree to which technical undergraduate students trust that the deployment of CIDOS e-Learning platform will increase the effectiveness of technology used.

1.10.2 Perceived Ease of Use

Perceived ease of use is an indicator to evaluate the way a system's utility and easiness affects users' perception and intention to use the system (Davis, Bagozzi, & Warshaw, 1989). It is a common belief that the use of an application will help instructors and students to understand and manage their task easily. In this study, perceived ease of use is defined as the degree to which the technical undergraduate students accept that employing CIDOS e-Learning will help them handle their tasks easily.

1.10.3 Learning Management System (LMS) Adoption

Adoption of the LMS is an early implementation of a system by an educational institution. It starts with the application of online collaboration materials, utilisation of course video application and use of hand-held clickers to assist out-of class interactions (Porter, Graham, Spring, & Welch, 2014). In this study, LMS adoption is defined as the attitude of deploying educational technology system (known as CIDOS e-Learning), with a variety of uses in digital information sharing and features of LMS. It involves the use of e-content, e-assessment and discussion forum to enhance pedagogical method, access and flexibility in education.

1.10.4 Compatibility

Compatibility is a situation which adapts between educators' requirement of the system's characteristics and the work habits on behaviour intention to apply the application (Wu & Wang, 2005; Chang & Tung, 2008). It examines the impacts of user's values, prior experiences and requirements towards LMS deployment (Rogers, 1995). In this study, compatibility refers to a situation that assesses the effects of technical undergraduate students' values, prior experiences and needs towards consistent use of CIDOS e-Learning.

1.10.5 Application Self-Efficacy

Application self-efficacy captures an individual's attributes that influence his or her intention to use a system (Coskuncay & Ozkan, 2013). In other words, it describes the individual's characteristics that influence the instructors' judgment and evaluation process about the capability of LMS usage (Karaiskos, 2009). In this study, application self-efficacy is defined as attitude of evaluating the implications of technical undergraduate students' perception on the skilful, self-confidence, interaction, effectiveness and capabilities of using CIDOS e-Learning.

1.10.6 Subjective Norm

Subjective norm is perceived as social difficulties in the implementation of a particular attitude and the desire to satisfy individual pressures and constraints (Hyde & White, 2009). It refers to the evaluation of the implications of other's view on the decision to perform certain behaviours according to related recommendations (Coskuncay & Ozkan, 2013). In the present study, subjective norm relates to the degree to which a student perceives the requests of those involved, such as the instructors, course mates and polytechnic authorities, on the decision to employ CIDOS e-Learning.

1.10.7 Technological Complexity

Thompson, Higgins and Howell (1991) regarded technological complexity as the level to which technology is perceived as relatively difficult to understand and apply. It involves the process of evaluating viewpoints on the influence of system complexity on the intention of instructors and students (Teo, 2009). In this study, technological complexity refers to technical undergraduate students' level to which technology is perceived as relatively difficult to apply in CIDOS e-Learning.

1.10.8 Technology Utilisation

Technology utilisation is a practice which entails instructors and learners to self-manage digital materials via employing computer platform, updating information and using online applications and technology gadgets to perform task easily and achieve the required targets (Akkoyunlu & Soylu, 2008; Bonk & Graham, 2006). In this study, technology utilisation refers to technical undergraduate students' consistency and quality of CIDOS e-Learning employment in the context of system, information and service of the LMS.

1.10.8.1. Consistency of use

Consistency of use is an organised way of LMS technology employment in the context of interface and system design applicability, interoperability, simplicity of delivery administration, adaptive of interaction as well as user accessibility (Fathema & Sutton, 2013; Kim & Leet, 2008; Weaver *et al.*, 2008;). In this study, consistency of use refers to technical undergraduate students' usage of CIDOS e-Learning frequently, consistently and appropriately for academic purposes based on worthwhile and accessible features.

1.10.8.2 Quality of use

Quality of use is a character of technology utilisation that encourage educators to allow concentration to the learner's motives and alternatives to use system (Ibrahim, Yusoff, Khalil & Jaafar, 2011). The quality use of blog, social bookmarking tool, media sharing tools fosters educational entities to gain effective and productive education (Popescu, 2014). The predictive factors of technology use involve end users' support, quality utilisation and productivity (Van Aswegen, Huisman & Taylor, 2014). In this study, quality of use refers to vital traits of CIDOS e-Learning usage among undergraduate technical students which entail system, information and service to yield productivity, secure and impressive for better learning suitability of technologies.

Information

Information is ascertained an input to the knowledge valuation establishment mechanism. It is assumed by Nonaka (1994) that information refers to messages stream to create knowledge based on the strength of responsibility and beliefs. The correct information retrieved determines the information quality in the process of knowledge transformation. Information requires good accessibility and simplicity to ensure tools' ease of use are implemented (Pauleen, Agnihotri & Troutt, 2009). In this study, information refers to capability of CIDOS e-Learning to provide relevant, easy to understand, obvious, current content, sufficient and accurate instruction to technical undergraduate students during period of LMS employment in their studies.

Service

Service is a continuous support which embeds as interaction characteristic in learning technology device and system to enhance the practice of student-centred learning, collaborative as well as effective communication (Pilgrim *et al.*, 2012). The quick response support eases the smoothness of technology service (Roca *et al.*, 2006), infuses digital classroom to foster more multifaceted, exciting and variety for lifelong personalized learning (Ahmed & Nasser, 2015). In this study, service refers to facilities of CIDOS e-Learning that support quality of use in technology utilisation among undergraduate technical students based on the elements of simple

accessibility, communication, reliable, convenient and quick response when failure occurred.

System

System brings out decisive arrangement to the expansion process, which, in turn, boosts the performance of the design, quality of use and eases more expected outcomes (Huisman & Iivari, 2006). Pituch & Lee (2006) highlighted system ascertains optimum learning tools with various multimedia course materials and suitable regardless of place and learning session. In this study, system refers to CIDOS e-Learning yields flexibility in the aspects of time, location, multimedia forms in the course content and sufficient roles to assist teaching and learning session. System relates to reliability which enables user to obtain reasonable response time as well as interactive communication in technology utilisation.

1.10.9 Level of Integration

Level of integration refers to the four stages of SAMR model originally introduced by Puentedura (2006). It is based on the assumption that suitability of technology adoption can essentially illustrate the character of educational activity to suit the specific targets (Melhuish & Falloon, 2010). The levels are substitution, augmentation, modification and redefinition (SAMR). In this study, level of integration covers four levels in SAMR model to determine CIDOS e-Learning's technology integration among undergraduate technical students.

Substitution

Substitution is a first level in SAMR model as level of enhancement and attempt to replace manual methods with ICT-based approaches (Jude, Kajura & Birevu, 2014). Technology employment by educational attributes in this level involves an explicit replacement for non-digital option with no functional alteration (Puentedura, 2006). In this study, substitution entails ICT use as direct tools among undergraduate technical students while employing CIDOS e-Learning for enrolled and blended course content with no practical change.

Augmentation

Augmentation refers as enhancement level which usage of digital tool in an existing technology provides a functional alteration (Puentedura, 2012; Schrock, 2014). This second level has more flexible of education chances regardless of place (Gikas & Grant, 2013) and apps used as supplement (Ahmed & Nasser, 2015). In this study, augmentation involves ICT use as direct tools among undergraduate technical

students while employing CIDOS e-Learning for enrolled and blended course content with functional development.

Modification

Modification refers as transformation level which allows an important task redesign using technology to entirely alter the approach in which learning materials are conveyed (Puentedura, 2010). The third level in SAMR model admits technology gadgets applied to create short video (Jacobs-Israel & Moorefield-Lang, 2013). In this study, modification involves redesigning process that is embedded with technology to encourage undergraduate technical students to create activities, explore and infuse CIDOS e-Learning tools and other applications such as blogs, videos, Google docs and digital library to accomplish learning targets.

Redefinition

Redefinition is a fourth level in SAMR model which functions are related to transformation process. In these levels, adjustment or re-description of educational activities implemented is attainable by the utilisation of digital technologies to contribute new assignment, learning skill and improved learning setting (Driver, 2012; Selwyn, 2010). In this study, redefinition is defined as a process level of creating a new task and educational experience with functions of technology application. For example, the uses of group discussion facility, social media, open educational resources, mobile device, online assessment tools and video conferencing among undergraduate technical students.

REFERENCES

Abdelhakim, M. N. A., & Shirmohammadi, S. (2008). Improving Educational Multimedia selection process using group decision support systems. *International Journal of Advanced Media and Communication*, *2*(2), 174–190.

Abdullah Muhammad (2014). *Development of activity-based mLearning implementation model for undergraduate English Language learning.* Unpublished doctoral dissertation, Universiti Malaya, Malaysia.

Abdullah, A. (2006). The Malaysian smart school initiative: Deconstructing secondary education. *Digital learning*, *11*(12), 6-8.

Abdullah, F., Ward, R., & Ahmed, E. (2016). Investigating the influence of the most commonly used external variables of TAM on students' Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of e-portfolios. *Computers in Human Behavior*, *63*(1), 75–90.

Abdullah, M. R. T. L., Siraj, S., Asra, & Hussin, Z. (2014). Interpretive structural modeling of mlearning curriculum implementation model of English Language communication skills for undergraduates. *Turkish Online Journal of Educational Technology*, *13*, 151–161.

Abel, F., Bittencourt, I., Costa, E., Henze, N., Krause, D. & Vassileva, J. (2010). Recommendations in online discussion forums for e-learning systems. *IEEE Transactions on Learning Technologies*, *3*(2) 146–165.

Abu Samah, B (2016). Enhancing extension education research using Structural Equation Modeling: Enriching Evidence-Based Extension Work Practices. *Inaugural Lecture Series*. Universiti Putra Malaysia Press, 1-82.

Accuosti, J. (2014). Factors affecting education technology success. *Proceeding of the ASEE 2014 Zone I Conference, April 3–5, 2014*, University of Bridgeport, Bridgpeort, CT, USA.

Adamson, I., & Shine, J. (2003). Extending TAM to measure end user computer satisfaction in a mandatory environment: A bank's treasury. *Technology Analysis and Strategic Management Journal*, *15*(4), 441–454.

Adiguzel, A. (2010). The status of instructional technology in the primary schools and classroom teachers' level of using these technologies. *Dicle University Ziya Gökalp Education Faculty Journal*, *15*(1), 1–17.

Afshari, M., Bakar, K. A., Luan, W. S., Samah, B. A., & Fooi, F. S. (2008). School leadership and information communication technology. *TOJET: The Turkish Online Journal of Educational Technology, 7*(4), 82-91.

Afthanorhan, W. M. A. B. W., & Ahmad, S. (2013). Modelling The Multigroup Moderator-Mediator On Motivation Among Youth In Higher Education

Institution Towards Volunteerism Program. *International Journal of Scientific & Engineering Research (IJSER)*, *4*(7), 91-95.

Afthanorhan, W., Ahmad, S., & Mamat, I. (2014). Pooled Confirmatory Factor Analysis (PCFA) using structural equation modeling on volunteerism program: A step by step approach. *International Journal of Asian Social Science*, *4*(5), 642–653.

Agarwal, R. & Prasad, J., (1998). A conceptual and operational definition of personal innovativeness in the domain of information technology. *Information Systems Research*, *9*(2), 204–215.

Agarwal, R., & Karahanna, E. (2000). Time flies when you're having fun: Cognitive absorption and beliefs about Information Technology usage. *MIS Quarterly*, *24*(4), 665-694.

Agyemang, M. (2012). *Technology use among Ghanaian senior high school mathematics teachers and students and factors that influence it.* Unpublished master's thesis, University of Education, Ghana.

Ahmad M.F.B., Kamarul A.A.R., & Mohd S.E. (2010). Kesediaan Dan Kesedaran P&P Berasaskan CIDOS Di Politeknik Seberang Perai. *Prosiding Seminar Transformasi Pendidikan Teknikal (MyTEDT'10).* pp. 166-171.

Ahmed, K., & Nasser, O. (2015). Incorporating iPad Technology: Creating More Effective Language Classrooms. *TESOL Journal*, *6*(4), 751–765.

Ajzen, I. & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behavior* . Englewood Cliffs, NJ: Prentice-Hall.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211.

Ajzen, I., & Fishbein, M. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research.* Reading, MA: Addison-Wesley.

Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin*, *84*(5), 888-918.

Akkoyunlu, B., & Soylu, M. Y. (2008). A study of student's perceptions in a blended learning environment based on different learning styles. *Educational Technology & Society*, *11*(1), 183–193.

Aksit, N. (2007). Educational reform in Turkey. *International Journal of Educational Development*, *27*(2), 129–137.

Alalwan, A. A., Dwivedi, Y. K., Rana, N. P., Lal, B., & Williams, M. D. (2015). Consumer adoption of Internet banking in Jordan: Examining the role of hedonic motivation, habit, self-efficacy and trust. *Journal of Financial Services Marketing*, *20*(2), 145–157.

Al-Busaidi, K. A. (2009). The Impact of Learning Management System Characteristics and User Characteristics on the Acceptance of E-Learning. *International Journal of Global Management Studies*, *1*(2), 1-10.

Al-Busaidi, K. A. (2013). An empirical investigation linking learners' adoption of blended learning to their intention of full e-learning. *Behaviour & Information Technology*, *32*(11), 1168–1176.

Al-Busaidi, K. A., & Al-Shihi, H. (2010). Instructors ' Acceptance of Learning Management Systems : A Theoretical Framework. *Communications of the IBIMA 2010*, 1–10.

Alhomod, S., & Shafi, M. M. (2013). Success factors of e-learning projects: A technical perspective. *TOJET: The Turkish Online Journal of Educational Technology*, *12*(2), 247-253.

Al-Huneidi, A. M., & Schreurs, J. (2012). Constructivism Based Blended Learning in Higher Education. *International Journal of Emerging Technologies in Learning (iJET)*, *7*(4), 4–10.

Ali, M., & Park, K. (2016). The mediating role of an innovative culture in the relationship between absorptive capacity and technical and non-technical innovation. *Journal of Business Research*, *69*(5), 1669–1675.

Ali, W. Z. W., Nor, H. M., Hamzah, A., & Alwi, N. H. (2009). The conditions and level of ICT integration in Malaysian Smart Schools. *International Journal of Education and Development using ICT*, *5*(2). 1-9.

Alias, N. A. (2012). Design of a motivational scaffold for the Malaysian e-learning environment. *Journal of Educational Technology & Society*, *15*(1), 137-151.

Al-Khalifa, H. S. (2010 a). *A First Step in Evaluating the Usability of JUSUR Learning Management System.* Paper presented at the The 3rd Annual Forum on e-Learning Excellence in the Middle East 2010: Bringing Global Quality to a Local Context. February 1st - 3rd, Dubai, U.A.E.

Al-Khalifa, H. S. (2010 b). E-learning in Saudi Arabia. In U. Demiray (Ed.), *E-learning practices* (Vol. 2, pp.745-772). Eskisehir-Turkey: Anadolu University.

Alkhunaizan, A., & Love, S. (2013). Effect of demography on mobile commerce frequency of actual use in Saudi Arabia. In *Advances in information systems and technologies* (pp. 125–131). Springer.

Allen, M. W. (2011). *Designing successful e-learning: Forget what you know about instructional design and do something interesting*. San Francisco : John Wiley & Sons.

Al-Qeisi, K. I. (2009). *Analyzing the use of UTAUT model in explaining an online behaviour: Internet banking adoption*. ProQuest dissertation and Theses

database. Unpublished doctoral dissertation, University Brunel Business School, Brunel.

Al-Qirim, N. (2015). An empirical investigation of smart board innovations in teaching in UAE University. *Education and Information Technologies*, *21*(6), 1895-1911.

Alrasheedi, M., & Capretz, L. F. (2015). Determination of Critical Success Factors Affecting Mobile Learning: A Meta-Analysis Approach. *Turkish Online Journal of Educational Technology*, *14*(2), 41-51.

Al-Samarraie, H., Selim, H., & Zaqout, F. (2016). The effect of content representation design principles on users' intuitive beliefs and use of e-learning systems. *Interactive Learning Environments*, *24*(8), 1758-1777.

Alshammari, S. H., Ali, M. B., & Rosli, M. S. (2016). The Influences of Technical Support, Self-Efficacy and Instructional Design on the Usage and Acceptance of LMS: A Comprehensive Review. *Turkish Online Journal of Educational Technology*. *15*(2), 116-125.

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*(1), 129-140.

Alwin, D. F., & Hauser, R. M. (1975). The decomposition of effects in path. American *Sociological Review*, *40*(1), 36–47.
and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology*, 40*(1)*, 92–118.

Anderson, J. & Weert, T. (2002). Information and communication technology in education. In *proceedings of Curriculum for schools and programme of teacher development* (pp. 434-342). Paris, France.

Andersson, S. B. (2006). Newly qualified teachers' learning related to their use of information and communication technology: A Swedish perspective. *British Journal of Educational Technology*, *37*(5), 665–682.

Archer, K., Savage, R., Sanghera-Sidhu, S., Wood, E., Gottardo, A., & Chen, V. (2014). Examining the effectiveness of technology use in classrooms: A tertiary meta-analysis. *Computers & Education*, *78*(1), 140–149.

Arpaci, I., Kilicer, K., & Bardakci, S. (2015). Effects of security and privacy concerns on educational use of cloud services. *Computers in Human Behavior*, *45*(1), 93–98.

Arroway, P., Davenport, E., Xu, G., & Updegrove, D. (2010). EDUCAUSE core data service fiscal year 2009 summary report. *EDUCAUSE White Paper*.

Ary, D., Jacobs, L. C., Sorensen, C. K., & Walker, D. (2013). *Introduction to research in education*. (9th Ed.). Cengage Learning. Belmoth, CA, USA: Wadsworth Cengage Learning.

Ashraf, A. R., Thongpapanl, N., & Auh, S. (2014). The application of the technology acceptance model under different cultural contexts: The case of online shopping adoption. *Journal of International Marketing*, *22*(3), 68–93.

Asiri, M. J. S., Mahmud, R., Bakar, K. A., & Mohd Ayub, A. F. (2012). Factors influencing the use of learning management system in Saudi Arabian Higher Education: A theoretical framework. *Higher Education Studies*, *2*(2), 125-137.

Astrachan, C. B., Patel, V. K., & Wanzenried, G. (2014). A comparative study of CB-SEM and PLS-SEM for theory development in family firm research. *Journal of Family Business Strategy*, *5*(1), 116–128.

Atif, A., Richards, D., Busch, P., & Bilgin, A. (2015). Assuring graduate competency: A technology acceptance model for course guide tools. *Journal of Computing in Higher Education*, *27*(2), 94–113.

Awang Z., (2012). *Research Methodology and Data Analysis*. Second Edition. Selangor, Malaysia: Penerbit Universiti Teknologi MARA Press.

Awang, Z. (2014). *A Handbook on Structural Equation Modeling for Academicians and Practitioner.* Selangor, Malaysia: MPWS Rich Resources.

Awang, Z. (2015*). SEM Made Simple. A Gentle Approach to Learning Structural Equation Modeling.* Selangor, Malaysia: MPWS Rich Publication Sdn Bhd.

Awang, Z., Afthanorhan, W. M. A. W., & Asri, M. A. M. (2015). Parametric and non-parametric approach in structural equation modeling (SEM): The application of bootstrapping. *Modern Applied Science*, *9*(9), 58.

Aydin, C. H., & McIsaac, M. S. (2004). The impact of instructional technology in Turkey. *Educational Technology Research and Development*, *52*(1), 105–112.

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.

Azlim, M., Amran, M., & Rusli, M. R. (2015). Utilization of Educational Technology to Enhance Teaching Practices: Case Study of Community College in Malaysia. *Procedia-Social and Behavioral Sciences*, *195*(1), 1793–1797.

Babbie E.R. (1990). *Survey Research Method*, (2nd Ed.). California: Cengage Wadsworth, Inc.

Babbie, E. (2015). *The Practice of Social Research*. *Practice of* (10th Ed.). Belmont, CA, USA: Wadsworth/Thomson .

Babo, R., & Azevedo, A. (2012). *Higher education institutions and learning management systems: Adoption and standardization*. United States of America: IGI Global.

Bagozzi, R. P., & Schnedlitz, P. (1985). Social contingencies in the attitude model: A test of certain interaction hypotheses. *Social Psychology Quarterly*, *48*(4), 366–373.

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

Bagozzi, R. P., Davis, F. D., & Warshaw, P. R. (1992). Development and test of a theory of technological learning and usage. *Human Relations*, *45*(7), 659–686.

Bagozzi, R.P., & Yi, Y. (2012). Specification, evaluation, and interpretation of structural equation models. *Journal of the Academy of Marketing Science*. *40*(1), 8-34.

Bailey, J. E., & Pearson, S. W. (1983). Development of a tool for measuring and analyzing computer user satisfaction. *Management Science*, *29*(5), 530–545.

Bakar, A. B. A., & Ariffin, M. Y. M. (2013). The Usage of E-Journal Amongst Lecturers at a Public University in Malaysia. *TOJET: The Turkish Online Journal of Educational Technology*, 12(2), 321-329.

Bakhtiyari, K., Salehi, H., Embi, M. A., Shakiba, M., Zavvari, A., Shahbazi-Moghadam, & M., Mohammadjafari, M. (2014). Ethical and unethical methods of plagiarism prevention in academic writing. *International Education Studies*, *7*(7), 52–62.

Baleghi-Zadeh, S., Ayub, A. F. M., Mahmud, R., & Daud, S. M. (2014). Behavior Intention To Use of Learning Management System Among Malaysian Pre-Service Teachers: A Confirmatory Factor Analysis. *International Journal of Education and Literacy Studies*, *2*(1), 29–39.

Ball, D. M., & Levy, Y. (2008). Emerging educational technology: Assessing the factors that influence instructors' acceptance in information systems and other classrooms. *Journal of Information Systems Education*, *19*(4), 431-443.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, *37*(2), 122-147.

Bandura, A., (1977). *Social Learning Theory*., Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A., (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Prentice-Hall, Englewood Cliffs, NJ.

Barak, M. (2014). Closing the gap between attitudes and perceptions about ICT-enhanced learning among pre-service STEM teachers. *Journal of Science Education and Technology*, *23*(1), 1-14.

Barlett, 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*(6), 1173-1182.

Barrett, T. (2010). The problem-based learning process as finding and being in flow. *Innovations in Education and Teaching International*, *47*(2), 165–174.

Becker, M. R., Winn, P., & Erwin, S. L. (2015). Student-Centered, e-Learning Design in a University Classroom. In P. Isaías, J. M. Spector, D. Ifenthaler, & D. G. Sampson (Eds.), *E-Learning Systems, Environments and Approaches: Theory and Implementation.* (pp. 229–246). Cham: Springer International Publishing.

Bennison, A., & Goos, M. (2010). Learning to teach mathematics with technology: a survey of professional development needs, experiences and impacts. *Mathematics Education Research Journal*, *22*(1), 31-56.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, *107*(2), 238-246.

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, *88*(3), 588-606.

Bere, A., & Rambe, P. (2016). An empirical analysis of the determinants of mobile instant messaging appropriation in university learning. *Journal of Computing in Higher Education*, *28*(2), 172–198.

Bertacchini, F., Bilotta, F., Pantano, P., & Tavernise, A. (2012). Motivating the learning of science topics in secondary school: A constructivist edutainment setting for studying Chaos. *Computers & Education*, *59*(4), 1377–1386.

Bhatiasevi, V., & Naglis, M. (2016). Investigating the structural relationship for the determinants of cloud computing adoption in education. *Education and Information Technologies*, *21*(5), 1197–1223.

Bhattacherjee, A. (2001). Understanding information systems continuance: An expectation-confirmation model. *MIS Quarterly*, *25*(3), 351–370.

Bhattacherjee, A., & Hikmet, N. (2007). Physicians' resistance toward healthcare information technology: a theoretical model and empirical test. *European Journal of Information Systems*, *16*(6), 725–737.

Bhattacherjee, A., & Premkumar, G. (2004). Understanding changes in belief and attitude toward information technology usage: A theoretical model and longitudinal test. *MIS Quarterly*, 229–254.

Bhatti, T. (2007). Exploring Factors Influencing the Adoption of Mobile Commerce. *Journal of Internet Banking and Commerce*, *12*(3), 11-23.

Billings, D.M., Connors, H.R., & Skiba, D.J. (2001). Benchmarking best practices in Web based nursing courses. *Advances in Nursing Science, 23(*3), 41–52.

Black, E. W., Beck, D., Dawson, K., Jinks, S., & DiPietro, M. (2007). Considering implementation and use in the adoption of an LMS in online and blended learning environments. *TechTrends, 51*(2), 35–53.

Black, T. R. (1993). *Evaluating social science research: An introduction*. California, USA: Sage Publications.

Black, T. R. (1999). *Doing quantitative research in the social sciences: An integrated approach to research design, measurement and statistics*. California, USA: Sage Publications.

Blended Learning Report (2015). *Individual Polytechnic BL from 1st June 2015-30th November. Polytechnic E-Learning portal.* Retrieved from http://portal.cidos.edu.my.

Blended Learning Report (2016). *Individual Polytechnic BL from 15th November 2015-3rd April 2016. Polytechnic E-Learning portal.* Retrieved from http://portal.cidos.edu.my.

Blin, F., & Munro, M. (2008). Why hasn't technology disrupted academics' teaching practices? Understanding resistance to change through the lens of activity theory. *Computers & Education*, *50*(2), 475–490.

Bollegala, D., Matsuo, Y., & Ishizuka, M. (2011). A web search engine-based approach to measure semantic similarity between words. *Knowledge and Data Engineering, IEEE Transactions on knowledge and data engineering*, *23*(7), 977–990.

Bollen, K. A. (1989*). Structural Equations with Latent Variables*, New York: JohnWiley & Sons. Inc.

Bonk, C. J., & Graham, C. R. (2006). *The handbook of blended learning*. San Francisco, CA: Pfeiffer.

Booker, L. D., Detlor, B., & Serenko, A. (2012). Factors affecting the adoption of online library resources by business students. *Journal of the American Society for Information Science and Technology*, *63*(12), 2503–2520.

Boomsma, A., & Hoogland, J. J. (2001). The robustness of LISREL modeling revisited. In *R. Cudeck, S. du Toit, & D. Sörbom (Eds.), Structural equation modeling: Present and future* (pp. 139–168). Chicago: Scientific Software International.

Bostrom, R. P., Gupta, S., & Thomas, D. (2009). A meta-theory for understanding information systems within sociotechnical systems. *Journal of Management Information Systems*, *26*(1), 17–48.

Bower, M. (2015). A typology of Web 2.0 learning technologies. *EDUCAUSE, Feb*, *8*, 2015. Retrieves from http://net.educause.edu/ir/library/pdf/csd6280.pdf.

Bowling, A. (1997). Questionnaire design. In: *Research Methods in Health*. Buckingham: Open University Press.

Bradley, M., Carter, J., Fitzsimons, D., Graham, J., Hurlbut, N., & Marshall, D., (2007). *Learning management system evaluation report. Executive summary.* Berlin: Humboldt University.

Breiter, A. (2004). Requirements development in loosely coupled systems: Building a knowledge management system with schools. In *System Sciences, 2004. Proceedings of the 37th Annual Hawaii International Conference on System Sciences* (pp. 1-10). United States of America, 5-8 Jan 2004.

Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies & academic achievement in online higher education learning environments: A systematic review. *Internet and Higher Education*, *27*(1), 1–13.

Brown, S.A., Dennis, A. R., & Venkatesh, V. (2010). Predicting collaboration technology use: Integrating technology adoption and collaboration research. *Journal of Management Information Systems*, *27*(2), 9–54.

Brown, T. H. (2005). Towards a model for m-learning in Africa. *International Journal on E-Learning*, *4*(3), 299-315.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K.A. Bollen & J.S. Long (Ed.). *Testing Structural Equation Models.* New Bury Park, California: Sage Focus Editions, 136-154.

Browne, T., Hewitt, R., Jenkins, M., & Walker, R. (2008). *Survey of Technology Enhanced Learning for higher education in the UK Rethinking the digital divide.* Oxford, United Kingdom : UCISA.

Browne, T., Jenkins, M., & Walker, R. (2006). A longitudinal perspective regarding the use of VLEs by higher education institutions in the United Kingdom. *Interactive Learning Environments*, *14*(2), 177–192.

Bryant, C. G. A., & Jary, D. (2001). *The contemporary Giddens: Social theory in a globalizing age*. Palgrave.

Bryman, A., & Cramer, D. (2005). *Quantitative data analysis with SPSS 12 and 13: A guide for social scientists*. New York: Routledge.

Bryne, B. M. (2010) *Structural Equation Modelling with AMOS: Basic Concepts, Applications and Programming, (2nd ed.)*. New York: Routledge.

Buchem, I., & Hamelmann, H. (2011). E-learning Papers (n.d) *Developing 21st century skills: Web 2.0 in Higher Education-A case study.* Retrieve June 24, 2015, from http://elearningpapers.eu/sites/default/files/media25535.pdf

Buckley, P., & O'Brien, F. (2017). The effect of malicious manipulations on prediction market accuracy. *Information Systems Frontiers*. *19*(3). 611–623.

Burton Jones, A., & Hubona, G. S. (2006). The mediation of external variables in the technology acceptance model. *Information & Management*, *43*(6), 706–717.

Byrne, B. M. (2010). Structural equation modeling with AMOS: Basic concepts, applications, and Programming (2nd ed.). Mahwah, NJ: Erlbaum.

Byrne, B. M. (2016). *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. New York: Routledge.

Cain, M. K., Zhang, Z., & Yuan, K.H. (2016). Univariate and multivariate skewness and kurtosis for measuring nonnormality: Prevalence, influence and estimation. *Behavior Research Methods*. *49*(241). 1–20.

Calisir, F., & Calisir, F. (2004). The relation of interface usability characteristics, perceived usefulness, and perceived ease of use to end-user satisfaction with enterprise resource planning (ERP) systems. *Computers in Human Behavior*, *20*(4), 505–515.

Calisir, F., Altin Gumussoy, C., Bayraktaroglu, A. E., & Karaali, D. (2014). Predicting the intention to use a web-based learning system: Perceived content quality, anxiety, perceived system quality, image, and the technology acceptance model. *Human Factors and Ergonomics in Manufacturing & Service Industries*, *24*(5), 515–531.

Campión, R. S., Nalda, F. N., & Rivilla, A. M. (2012). Web 2.0 and higher education: Its educational use in the university environment. *European Journal of Open, Distance and E-Learning*, 15(2), 1-20.

Cardullo, V., & Burton, M. (2015). Building relationship through learning communities and participation in online learning environments: Building interactions in online learning. In K.B. Lydia, B. Joseph, E. Ntuli & C. Agyeman (Eds.), *Handbook of Research on Strategic Management of Interaction, Presence, and Participation in Online Courses* (pp. 448-471). Idaho, USA: Information Science Reference.

Carlos, A.H., Miguel L., B.L., Eduardo, G.S., Juan I., A.P., Guillermo, E.G., & Adolfo, R.C. (2013). Enhancing Learning Environments by Integrating External Applications. *Bulletin of the IEEE Technical Committee on Learning Technology*, *15*(1), 21–24.

Carmean, C., & Haefner, J. (2002). Mind over Matter: Transforming Course Management Systems into Effective Learning Environments. *Educause Review*, *37*(6), 26–34.

Cavanaugh, C., Hargis, J., Munns, S., & Kamali, T. (2013). iCelebrate teaching and learning: Sharing the iPad experience. *Journal of Teaching and Learning with Technology*, *1*(2), 1–12.

Cavus, N. (2013). Selecting a learning management system (LMS) in developing countries: instructors' evaluation. *Interactive Learning Environments*, *21*(5), 419–437.

Cavus, N., & Momani, A.M. (2009). Computer aided evaluation of learning management systems. *Procedia-Social and Behavioral Sciences*, *1*(1), 426–430.

Chafiq, N., Benabid, A., Bergadi, M., Touri, B., Talbi, M., & Lima, L. (2014). Advantages and Limits of the Implementation of Blended Learning for Development of Language Skills in Scientific Students. *Procedia-Social and Behavioral Sciences*, *116*, 1546–1550.

Chan, S. C., & Lu, M. T. (2004). Understanding Internet banking adoption and user behavior: A Hong Kong perspective. *Journal of Global Information Management*, 12(3), 21-43.

Chang, C. (2003). Towards a distributed web based learning community, *Innovation in Education and Teaching International*, *40*(1), 27–42.

Chang, I., & Kim, J. (2011). An analysis of structural model on the employees' learning intention using smart devices. *Journal of Vocational Education & Training*, *14*(3), 105-126.

Chang, S. C., & Tung, F. C. (2008). An empirical investigation of students' behavioural intentions to use the online learning course websites. *British Journal of Educational Technology*. *39*(1), 71-83.

Chang, Y.H., Chang, C.Y., & Tseng, Y.H. (2010). Trends of science education research: An automatic content analysis. *Journal of Science Education and Technology*, *19*(4), 315–331.

ChanLin, L. J. (2012). Learning strategies in web-supported collaborative project. *Innovations in Education and Teaching International*, *49*(3), 319–331.

Chantarangsi, W., Liu, W., Bretz, F., Kiatsupaibul, S., Hayter, A. J., & Wan, F. (2015). Normal probability plots with confidence. *Biometrical Journal*, *57*(1), 52–63.

Chau, P. Y. K., & Hu, P. J. (2001). Information technology acceptance by individual professionals: A model comparison approach. *Decision Sciences*, *32*(4), 699–719.

Chau, P. Y. K., & Lai, V. S. K. (2003). An empirical investigation of the determinants of user acceptance of internet banking. *Journal of Organizational Computing and Electronic Commerce*, *13*(2), 123–145.

Chen, B. H., & Chiou, H.H. (2014). Learning style, sense of community and learning effectiveness in hybrid learning environment. *Interactive Learning Environments*, *22*(4), 485–496.

Chen, I. J., Yang, K.F., Tang, F.-I., Huang, C.H., & Yu, S. (2008). Applying the technology acceptance model to explore public health nurses' intentions towards web-based learning: a cross-sectional questionnaire survey. *International Journal of Nursing Studies*, *45*(6), 869–878.

Chen, L.D., Gillenson, M.L.,& Sherrell, D.L., (2002). Enticing online consumers: an extended technology acceptance perspective. *Information and Management*, *39*(8), 705–719.

Chen, S.C., & Li, S.H. (2010). Consumer adoption of e-service: Integrating technology readiness with the theory of planned behavior. *African Journal of Business Management*, *4*(16), 3556-3564.

Cheng, Y. M. (2011). Antecedents and consequences of e-learning acceptance.*Information Systems Journal*, *21*(3), 269-299.

Cheng, Y. M. (2015). Towards an understanding of the factors affecting m-learning acceptance: Roles of technological characteristics and compatibility. *Asia Pacific Management Review, 20*, 109–119.

Cheok, M. L., & Wong, S. L. (2016). Frog Virtual Learning Environment for Malaysian Schools: Exploring Teachers' Experience. In J.Zhang, J. Yang, M. Chang & T. Chang (Eds.), *ICT in Education in Global Context* (pp. 201–209). Singapore: Springer.

Cherian, L. & Shumba, A., (2011). Sex differences in attitudes toward science among Northern – Sotho speaking learners in South Africa. *Africa Education Review, 8*(2), 286–301.

Cheung, W., & Huang, W. (2005). Proposing a framework to assess internet usage in university education: an empirical investigation from a student's perspective. *British Journal of Educational Technology*, *36*(2), 237–253.

Chew, E., Ding, S. L., & Rowell, G. (2015). Changing attitudes in learning and assessment: cast-off "plagiarism detection"and cast-on self-service assessment for learning. *Innovations in Education and Teaching International*, *52*(5), 454–463.

Chidambaram, L. (1996). Relational development in computer-supported groups. *MIS Quarterly*, 143–165.

Chiemeke, S.C., Evwiekpaefe, A.E. & Chete, F.O. (2006). The adoption of internet banking in Nigeria: An empirical investigation. *Journal of Internet Banking & Commerce*, 11(3), 1-10.

Chin, W. W., Gopal, A., & Salisbury, W. D. (1997). Advancing the Theory of Adaptive Structuration: The Development of a Scale to Measure Faithfulness of

Appropriation. *Information Systems Research*, *8*, 342–367. doi:10.1287/isre.8.4.342

Chin, W.W., Peterson, R.A. & Brown, P.S. (2008). Structural equation modelling in marketing: Some practical reminders. *Journal of Marketing Theory and Practice*, 16(4), 287–98.

Chinyamurindi, W., & Shava, H. (2015). An investigation into e-learning acceptance and gender amongst final year students: original research. *South African Journal of Information Management*, *17*(1), 1–9.

Chiu, C.M., Hsu, M.H., Sun, S.Y., Lin, T.C., & Sun, P.C. (2005). Usability, quality, value and e-learning continuance decisions. *Computers & Education*, *45*(4), 399–416.

Choi, J. H., Chung, K. M., & Park, K. (2013). Psychosocial predictors of four health-promoting behaviors for cancer prevention using the stage of change of Transtheoretical Model. *Psycho-Oncology*, *22*(10), 2253-2261.

Chou, A. Y., & Chou, D. C. (2011). Course management systems and blended learning: An innovative learning approach. *Decision Sciences Journal of Innovative Education*, *9*(3), 463–484.

Chou, C. C., Block, L., & Jesness, R. (2012). A case study of mobile learning pilot project in K-12 schools. *Journal of Educational Technology Development and Exchange*, *5*(2), 11–26.

Chou, C., & Tsai, M.J. (2007). Gender differences in Taiwan high school students' computer game playing. *Computers in Human Behavior*, *23*(1), 812–824.

Chudoba, K. M. (1999). Appropriations and patterns in the use of group support systems. *ACM SIGMIS Database*, *30*(3-4), 131–148.

CIDOS Monthly Hits Report (2013). *Statistics of users.* Ministry of Higher Education. Politeknik Merlimau, Melaka. Jabatan Matematik, Sains dan Komputer. Retrieved from http://portal.cidos.edu.my

CIDOS Users' Manual Version 2.5 (2015). *Manual Pengguna: Pensyarah*. Kementerian Pendidikan Malaysia. Jabatan Pengajian Politeknik. Bahagian Instruksional dan Pembelajaran. Retrieved from http://portal.cidos.edu.my

CIDOS Utilisation Report (2013). *Monthly Hits Report, CIDOS statistics*. Kementerian Pendidikan Malaysia. Jabatan Pengajian Politeknik. Unit Teknologi Maklumat dan Komunikasi. Politeknik Merlimau Melaka. Retrieved from http://portal.cidos.edu.my

CIDOS Version 1.8, (2010) . *Manual Pengguna: Pensyarah.* Kementerian Pendidikan Malaysia. Jabatan Pengajian Politeknik. Bahagian Instruksional dan Pembelajaran http://portal.cidos.edu.my

Cinque, T., & Brown, A. (2015). Educating generation next: Screen media use, digital competencies and tertiary education. *Digital Culture & Education*, *7*(1), 1-18.

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*. New York: John Wiley and Sons.

Cochrane, T., & Bateman, R. (2013). A mobile web 2.0 framework: Reconceptualizing teaching and learning. *Using Network and Mobile Technology to Bridge Formal and Informal Learning*, 57–92.

Cochrane, T., Antonczak, L., Keegan, H., & Narayan, V. (2014). Riding the wave of BYOD: Developing a framework for creative pedagogies. *Research in Learning Technology*, *22*(1). 1-14.

Cohen, J. (1992). Statistical power analysis. *Current Directions in Psychological Science*, *1*(3), 98–101.

Cohen, L. (2007). Research methods in education. (6th ed.). New York, NY: Routledge.

Cohen, L., Manion, L., & Morrison, K. (1994). *Research methods in education*. *Education* (Vol. 55, pp. 469–470). doi:10.1111/j.1467-8527.2007.00388_4.x

Cohen, L., Manion, L., & Morrison, K. (2013). *Research methods in education*. New York, NY: Routledge.

Cohen, S. A. (1987). Instructional alignment: Searching for a magic bullet. *Educational Researcher*, *16*(8), 16–20.

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*(12), 1250–1262.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*, *19*(2), 189–211.

Conner, C. (2002). *The influence of personal characteristics, perceived innovation characteristics, attitude, and subjective norm upon intent to adopt internet pharmacy service: An adoption of innovations study.* Unpublished doctoral dissertation. University of Texas, Austin, USA.

Connolly, T., Gould, C., Baxter, G. J., & 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: Adoption and standardization* (pp. 50–73). Hershey, PA: Information Science Reference.

Cooper, R. B., & Zmud, R. W. (1990). Information technology implementation research: a technological diffusion approach. *Management Science*, *36*(2), 123–139.

Cornuel, E., & Hawawini, G. (2005). The future of business schools. *Journal of Management Development*, *24*(9), 770–782.

Cortina J (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Application Psychology*, *78*(1), 98–104.

Coskuncay, D. F., & Ozkan, S. (2013). A model for instructors adoption of learning management systems: Empirical validation in higher education contextual. *The Turkish Online Journal of Educational Technology-TOJET*, *12*(2), 13-25.

Cover, T. M., & Thomas, J. A. (2012). *Elements of information theory*. John Wiley & Sons.

Creswell, J. (2012). W. 1994. Research Design: Qualitative and Quantitative Approaches. *Thousand Oaks*.

Creswell, J. W. (2014). *Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research*. Upper Saddle River, NJ: Pearson New International Edition.

D'Ambra, J., Wilson, C. S., & Akter, S. (2013). Application of the task-technology fit model to structure and evaluate the adoption of E-books by Academics. *Journal of the American Society for Information Science and Technology*, *64*(1), 48–64.

Dag, F. (2016). The Turkish Version of Web-Based Learning Platform Evaluation Scale: Reliability and Validity Study. *Educational Sciences: Theory and Practice*, *16*(5), 1531–1561.

Dalton, B., & Grisham, D. L. (2011). eVoc strategies: 10 ways to use technology to build vocabulary. *The Reading Teacher*, *64*(5), 306–317.

Daniel, J. (2012). *Sampling Essentials: Practical Guidelines for Making Sampling*. Los Angeles, USA: Sage

Dasar e-Pembelajaran Negara (DePAN) 2011, DePAN. (n.d). *Institusi Pengajian Tinggi. Kementerian Pengajian Tinggi Malaysia, Ed.). Putrajaya: Kementerian Pengajian Tinggi Malaysia.* Retrive April 26, 2015, from https://smart2.ums.edu.my/pluginfile.php/2/course/section/2/dasar_epembelajaran_negara_depan.pdf

Davies, M., Hewege, C., & Perera, L. (2013). Pedagogical significance of wikis: Towards gaining effective learning outcomes. *Journal of International Education in Business*, *6*(1), 51–70.

Davis, B., Carmean, C., & Wagner, E. D. (2009). The evolution of the LMS: From management to learning-deep analysis of trends shaping the future of eLearning. *Santa Rosa, CA: The eLearningGuild Research*.

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., (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319–339.

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.

Dawson, J. F. (2014). Moderation in management research: What, why, when, and how. *Journal of Business and Psychology*, *29*(1), 1–19.

De Smet, C., Bourgonjon, J., De Wever, B., 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.

DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for dependent variable. *Information Systems Research*, *3*(1), 60-95.

Delone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems*, *19*(4), 9–30.

Demirer, V., Bozoglan, B., & Sahin, I. (2013). Preservice teachers' Internet addiction in terms of gender, Internet access, loneliness and life satisfaction. *International Journal of Education in Mathematics, Science and Technology*,*1*(1), 56-63.

DePAN (2010). Dasar e-Pembelajaran Negara (DePAN) Untuk Institusi Pengajian Tinggi.

DeSanctis, G., & Poole, M. S. (1994). Capturing the complexity in advanced technology use: Adaptive structuration theory. *Organization Science*, *5*(2), 121–147.

Desjardins, F., Van Oostveen, R., Muirhead, W., & Goodman, W. M. (2011). Tablet PCs and reconceptualizing learning with technology: A case study in higher education. *Interactive Technology and Smart Education*, *8*(2), 78–93.

DeVellis, R. F. (2012). *Scale development: Theory and applications (3rd edition)*. Thousand Oaks, (Vol. 26). California: Sage publications.

Dias, S. B., & Diniz, J. A. (2013). FuzzyQoI model: A fuzzy logic-based modelling of users' quality of interaction with a learning management system under blended learning. *Computers and Education*, *69*(1), 38–59.

Dias, S.B., & Diniz, J.A. (2014). Towards an Enhanced Learning Management System for Blended Learning in Higher Education Incorporating Distinct Learners' Profiles. *Educational Technology & Society*, *17*(1), 307-319.

Dillard, J. P., & Meijnders, A. (2002). Persuasion and the structure of affect. In J.P. Dillard & M. Pfau (Ed.), *The Persuasion Handbook: Developments in Theory and Practice* (pp. 309–327). Thousand Oaks, California: Sage Publications

Dodd, B. J., & Antonenko, P. D. (2012). Use of signaling to integrate desktop virtual reality and online learning management systems. *Computers & Education*, *59*(4), 1099–1108.

Dore, L. H. G., Amaral, G. J. A., Cruz, J. T. M., & Wood, A. T. A. (2016). Bias-corrected maximum likelihood estimation of the parameters of the complex Bingham distribution. *Brazilian Journal of Probability and Statistics*, *30*(3), 385–400.

Drissi, M., & Talbi, M. (2009). Device of the remote training to prepare the Moroccan university students for doing scientific courses in French - FOSEL (French on online specific objectives). Retrieved from <http://www.radisma.info/document.php?id=687>.

Drissi, S., & Amirat, A. (2016). An experimental study to evaluate learning style personalisation in web-based adaptive e-learning systems. *International Journal of Innovation and Learning*, *20*(1), 1–25.

Driver, P. (2012). Pervasive games and mobile technologies for embodied language learning. *International Journal of Computer-Assisted Language Learning and Teaching (IJCALLT)*, *2*(4), 50–63.

Ducey, A. J., & Coovert, M. D. (2016). Predicting tablet computer use: An extended Technology Acceptance Model for physicians. *Health Policy and Technology*, *5*(3), 268-284.

Durndell, A., & Thomson, K. (1997). Gender and computing: A decade of change. *Computers in Education*, 28*(1)*, 1–9.

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.

Dzakiria, H., Don, M. S., & Abdul Rahman, H. (2012). Blended learning (BL) as pedagogical alternative to teach business communication course: case study of UUM executive diploma program. *Turkish Online Journal of Distance Education. 13*(3), 297-315.

Dziuban, C., Hartman, J., Cavanagh, T. B., & Moskal, P. D. (2011). Blended courses as drivers of institutional transformation. In A. Kitchenham (Ed.), *Blended learning across disciplines: Models for implementation* (pp. 17–37). Hershey, PA: Information Science Reference.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, *53*(1), 109–132.

Efron B. (1979). Bootstrap Method: Another Look at the Jackknife. *Annals of Statistics*. *7*(1). 1-26.

Ehsan, N., & Faili, H. (2013). Grammatical and context-sensitive error correction using a statistical machine translation framework. *Software: Practice and Experience*, *43*(2), 187–206.

El-Gayar, O. F., Moran, M., & Hawkes, M. (2011). Students' Acceptance of Tablet PCs and Implications for Educational Institutions. *Educational Technology & Society*, *14*(2), 58–70.

El-Ghalayini, H., & El-Khalili, N. (2012). An approach to designing and evaluating blended courses. *Education and Information Technologies*, *17*(1), 417–430.

Elkaseh, A. M., Wong, K. W., & Fung, C. C. (2016). Perceived ease of use and perceived usefulness of social media for e-learning in Libyan higher education: A structural equation modeling analysis. *International Journal of Information and Education Technology*, *6*(3), 192-199.

Ellis, R. A., Ginns, P., & Piggott, L. (2009). E-learning in higher education: some key aspects and their relationship to approaches to study. *Higher Education Research & Development*. *28*(3), 303-318.

Embi, M. A. (2011). e-Learning in Malaysian institutions of higher learning: Status, trends and challenges. In proceedings of *International Lifelong Learning Conference*, (pp. 14–15). Pacific Hotel, Kuala Lumpur, Malaysia, November 2011.

Embi, M. A., & Nordin, N. M. (2013). *Mobile learning: Malaysian initiatives & research findings.* Malaysia: Centre for Academic Advancement, Universiti Kebangsaan Malaysia.

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., & Adun, M.N., (2010). *E-Pembelajaran di IPTA Malaysia,* Bangi, Selangor : Pusat Pembangunan Akademik, Universiti Kebangsaan Malaysia. Jabatan Pengajian Tinggi, Kementerian Pengajian Tinggi Malaysia.

Embi, M.A., Atan, H., Abdul Aziz, S., Mohd Nordin, N., & Hamat, A. (2012). *Senario study* report e-learning module. Higher Education Leadership

Academy. Ministry of Higher Education & Centre for Academic Advancement. Universiti Kebangsaan Malaysia. 1-39.

Emelyanova, N., & Voronina, E. (2014). Introducing a learning management system at a russian university: Students' and teachers' perceptions. *International Review of Research in Open and Distance Learning*, *15*(1), 272–289.

Entwistle, N., McCune, V., & Hounsell, J. (2002). Approaches to studying and perceptions of university teaching-learning environments: Concepts, measures and preliminary findings. *Enhancing Teaching and Learning Environments in Undergraduate Courses Occasional Report, 1*.

Eow, Y. L. (2011). *Application of appreciative learning approach in computer games development towards promoting students creativity and intrinsic motivation.* Unpublished doctoral dissertation. Faculty of Educational Studies, Universiti Putra Malaysia, Malaysia.

Eow, Y. L., Wan Ali, W. Z., Mahmud, R., & Baki, R. (2009). Form one students' engagement with computer games and its effect on their academic achievement in a Malaysian secondary school. Computers & education, *53*(4), 1082-1091.

Erdoğmuş, N., & Esen, M. (2011). An investigation of the effects of technology readiness on technology acceptance in e-HRM. *Procedia-Social and Behavioral Sciences. 24*, 487–495.

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development,53*(4), 25-39.

Eteokleous-Grigoriou, N. (2009). Instilling a new learning, work and communication culture through systemically integrated technology in education. *Systems Research and Behavioral Science*. *26*(6), 707–716.

Evans, C. (2008). The effectiveness of m-learning in the form of podcast revision lectures in higher education. *Computers & Education*. *50*(2), 491–498.

F. Hair Jr, J., Sarstedt, M., Hopkins, L., & G. Kuppelwieser, V. (2014). Partial least squares structural equation modeling (PLS-SEM) An emerging tool in business research. *European Business Review, 26*(2), 106–121.

Fabian, K., & MacLean, D. (2014). Keep taking the tablets? Assessing the use of tablet devices in learning and teaching activities in the Further Education sector. *Research in Learning Technology*, *22*(1), 1-14.

Falk, C. F., & Biesanz, J. C. (2015). Inference and interval estimation methods for indirect effects with latent variable models. *Structural Equation Modeling: A Multidisciplinary Journal*, *22*(1), 24–38.

Fathema, N., & Sutton, K. L. (2013). Factors influencing faculty members' Learning Management Systems adoption behavior: An analysis using the Technology

Acceptance Model. *International Journal of Trends in Economics Management & Technology (IJTEMT)*, *2*(6). 20-28.

Fathema, N., Shannon, D., & Ross, M. (2015). Expanding The Technology Acceptance Model (TAM) to Examine Faculty Use of Learning Management Systems (LMSs) In Higher Education Institutions. *MERLOT Journal of Online Learning and Teaching*, *11*(2), 210–232.

Ferguson, R., Faulkner, D., Whitelock, D., & Sheehy, K. (2014). Pre-teens' informal learning with ICT and Web 2.0. *Technology, Pedagogy and Education*, *24*(2), 247-265.

Fernandez, E. (2013, May 28). ICT Vital for Education. *The New Straits Times.* Retrieved from http://www.nst.com.my/latest/ict-vital-for-education-1.288101.

Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research.* Addison-Wesley Pub. Co. *Reading, Mass*.

Fishbein, M., & Stasson, M. (1990). The Role of Desires, Self-Predictions, and Perceived Control in the Prediction of Training Session Attendance. *Journal of Applied Social Psychology,* 20, 173–198.

Ford, N., & Chen, S. Y. (2000). Individual differences, hypermedia navigation, and learning: an empirical study. *Journal of Educational Multimedia and Hypermedia*, *9*(4), 281–311.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50.

Foster, I., Zhao, Y., Raicu, I., & Lu, S. (2008). Cloud computing and grid computing 360-degree compared. *Grid Computing Environments Workshop*, 2008, 1–10.

Francescato, D., Porcelli, R., Mebane, M., Cuddetta, M., Klobas, J., & Renzi, P. (2006). Evaluation of the efficacy of collaborative learning in face-to-face and computer-supported university contexts. *Computers in Human Behavior*, *22*(2), 163–176.

Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. *Journal of Counseling Psychology*, *51*(1), 115-134.

Fridin, M. (2014). Kindergarten social assistive robot: First meeting and ethical issues. *Computers in Human Behavior*, *30*(1), 262–272.

Fuller, M. A., Hardin, A. M., & Davison, R. M. (2006). Efficacy in technology-mediated distributed teams. *Journal of Management Information Systems*, *23*(3), 209–235.

Furlong, J., & Davies, C. (2012). Young people, new technologies and learning at home: Taking context seriously. *Oxford Review of Education*, *38*(1), 45–62.

Gallagher, M. W., & Brown, T. A. (2013). Introduction to Confirmatory Factor Analysis and Structural Equation Modeling. In T.Teo (Ed.). *Handbook of Quantitative Methods for Educational Research* (pp. 289–314). United States of America: Springer.

Gan, C. L., & Balakrishnan, V. (2014). Determinants of mobile wireless technology for promoting interactivity in lecture sessions: An empirical analysis. *Journal of Computing in Higher Education*, *26*(2), 159–181.

Gao, L., & Bai, X. (2014). A unified perspective on the factors influencing consumer acceptance of internet of things technology. *Asia Pacific Journal of Marketing and Logistics*, *26*(2), 211–231.

García, H., Valles, A., Sánchez, J., Noriega, S., & Dominguez, G. (2017). Statistical equation modeling analysis for industrial projects, designing for critical factors and latent variables: quality, cost, time, and success. *The International Journal of Advanced Manufacturing Technology*, *88*(4), 767-779.

García-Peñalvo, F. J., Conde, M. Á., Alier, M., & Casany, M. J. (2011). Opening learning management systems to personal learning environments. *Journal of Universal Computer Science*, *17*(9), 1222–1240.

Garrison, D. G., & Anderson, T. (2003). *E-Learning in the 21st Century: A Framework for Research and Practice*. London, U.K: Routledge Falmer.

Garrote Jurado, R., & Pettersson, T. (2007). Lecturers' attitudes about the use of learning management systems in engineering education: A Swedish case study. *Australasian Journal of Educational Technology*, *23*(3), 327–349.

Gautreau, C. (2011). Motivational factors affecting the integration of a Learning Management System by faculty. *The Journal of Educators Online*, *8*(1), 1-25.

George, R., & Kaplan, D. (1998). A structural model of parent and teacher influences on science attitudes of eighth graders: Evidence from NELS: 88. *Science Education*, *82*(1), 93-109.

Ghavifekr, S., & Mahmood, H. (2015). Factors affecting use of e-learning platform (SPeCTRUM) among University students in Malaysia. *Education and Information Technologies*, *22*(1), 75-100.

Gikas, J., & Grant, M. M. (2013). Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media. *The Internet and Higher Education*, *19*(1), 18–26.

Gilok Choi & Hyewon Chung (2013) Applying the Technology Acceptance Model to Social Networking Sites (SNS): Impact of Subjective Norm and Social Capital on the Acceptance of SNS, International Journal of Human-Computer Interaction, 29:10, 619-628, DOI: 10.1080/10447318.2012.756333

Glasersfeld, E. von. (1995). Introduction: Aspects of constructivism. In F. C. T. (Ed.), *Constructivism: Theory perspectives, and practice* (pp. 3–7). Teacher College Press: Columbia University.

Goodhue, D. L., Lewis, W., & Thompson, R. (2012). Does PLS Have Advantages for Small Sample Size or Non-Normal Data? *MIS Quarterly*, *36*(3), 981–1016.

Gopal, A., Bostrom, R. P., & Chin, W. W. (1992). Applying adaptive structuration theory to investigate the process of group support systems use. *Journal of Management Information Systems*, *9*(3), 45–69.

Graf, S., & Liu, T.C. (2009). Supporting teachers in identifying students' learning styles in learning management systems: An automatic student modelling approach. *Journal of Educational Technology & Society*, *12*(4), 3-14.

Graham, C. R. (2006). Blended learning systems: Definition, current trends, and future directions. In C.J Bonk & C.R Graham (Eds.). *Handbook of blended learning: Global perspectives, local designs* (pp. 3–21). San Francisco: Wiley.

Gray, D.E. (2004). *Doing research in the real world: Qualitattive and Quantitative Approaches. First published.* California, US: Sage Publications.

Green, E., & Singleton, C. (2013). 'Gendering the Digital': The Impact of Gender and Technology Perspectives on the Sociological Imagination. In K. Orton-Johnson & N., Prior (Ed), *Digital Sociology* (pp. 34-50). Palgrave Macmillan, UK: Springer.

Green, L. S., Inan, F. A., & Denton, B. (2012). Examination of Factors Impacting Student Satisfaction with a New Learning Management System. *Turkish Online Journal of Distance Education (TOJDE)*, *13*(3), 189–197.

Gromik, N. (2012). Cell phone video recording feature as a language learning tool: A case study. *Computers & Education*, *58*(1), 223–230.

Grube, J. W., & Morgan, M. (1990). Attitude-social support interactions: Contingent consistency effects in the prediction of adolescent smoking, drinking, and drug use. *Social Psychology Quarterly*, *53*(4), 329–339.

Gu, J., Strauss, C., Bond, R., & Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clinical Psychology Review*. *37*(1). 1–12.

Gupta, S., & Bostrom, R. P. (2009). Technology-mediated learning: A comprehensive theoretical model. *Journal of the Association for Information Systems*, *10*(9), 686-714.

Gwebu, K.L. & Wang, J. (2011). Adoption of open source software: The role of social identification. *Decision Support Systems*, *5*(1), 220–229.

Ha, Y., & Im, H. (2014). Determinants of mobile coupon service adoption: assessment of gender difference. *International Journal of Retail & Distribution Management*, *42*(5), 441-459.

Hair J, Black W, Babin B, Anderson R, Tatham R (2010). *Multivariate data analysis*, (7th ed.). New Jersey: Pearson Prentice Hall.

Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage Publications.

Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage Publications.

Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Thousand Oaks: Sage Publications.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis, 5th Edition*. NY: Prentice Hall International.

Hair, J. F., Celsi, M. W., Money, A. H., Samouel, P., & Page, M. J. (2011). *Essentials of Business Research Methods*. Armonk, NY: ME Sharpe.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2013). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM), SAGE Publication, Inc., USA.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, *19*(2), 139–152.

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., Black, W.C., Rabin, B.J. & Anderson, R.E. (2010). *Multivariate Data Analysis: A global perspective. (7th Ed)*. Englewood Cliffs, NJ: Prentice Hall. *Vectors*. doi:10.1016/j.ijpharm.2011.02.019

Hak, A. A. (2015). An Analysis of the Acceptance's Staffs of Madrassa Library on" Senayan"-based Library Automation System Using Technology Acceptance Model (TAM). *Library Philosophy and Practice*, *1*(1), 1-20.

Halim, A. H., Zain, M. Z. M., Luan, W. S., & Atan, H. (2005). The taxonomical analysis of science educational software in Malaysian smart schools. *Malaysian Online Journal of Instructional Technology*, *2*(2), 106-113.

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, & Challenges* (pp. 29–51). Department of Higher Education, Ministry of Higher Education.

Hamdan, A., Din, R., Abdul Manaf, S. Z., Mat Salleh, N. S., Kamarul Zaman, M. F., & Ab Khalid, R. (2012). Penerimaan Pelajar Terhadap Penggunaan Teknologi Web 2.0 di Malaysia. In *International Seminar Educational Comparative in Competency Based Curriculum Between Indonesia and Malaysia* (pp. 380-387). Bandung, Indonesia.

Hamdan, A., Din, R., Abdul Manaf, S. Z., Mat Salleh, N. S., Kamsin, I. F., & Ismail, N. M. (2015). Exploring the relationship between frequency use of Web 2.0 and meaningful learning attributes. *Journal of Technical Education and Training*, *7*(1), 50-66.

Hamdan, A., Din, R., Adnan, A., Abdul Manaf, S. Z., Ismail, N. M., Mat Salleh, N. S., & Shafiin, H. (2013). Penggunaan Teknologi Web 2.0 Dalam Pembelajaran Hibrid. *Tempawan Jurnal Penyelidikan*, *1*(1), 87–103.

Han, I., & Han, S. (2014). Adoption of the mobile campus in a cyber-university. *International Review of Research in Open and Distance Learning*, *15*(6), 237–256.

Han, I., & Shin, W. S. (2016). The use of a mobile learning management system and academic achievement of online students. *Computers and Education*, *102*(1), 79-89.

Hao, S., Hong, W., Xu, H., Zhou, L., & Xie, Z. (2015). Relationship between resilience, stress and burnout among civil servants in Beijing, China: mediating and moderating effect analysis. *Personality and Individual Differences*. *83*(1). 65–71.

Harper, S., Jay, C., Michailidou, E., & Quan, H. (2013). Analysing the visual complexity of web pages using document structure. *Behaviour & Information Technology*, *32*(5), 491–502.

Hartman, D. K. (1992). Intertextudity and reading: The text, the reader, the author, and the context. *Linguistics and Education*, *4*(3), 295–311.

Hartshorne, R., & Ajjan, H. (2009). Examining student decisions to adopt Web 2.0 technologies: Theory and empirical tests. *Journal of Computing in Higher Education*, *21*(3), 183-198.

Harun, N., Majalis, L., & Mohamed, Z. (2015). Platform CIDOS dalam perlaksanaan pembelajaran teradun pelajar semester 1 di Politeknik Kuching, Sarawak. In *proceedings of the Technology and Innovation (TECHON) Conference* (pp. 250-265). Sarawak, Malaysia, December 2015.

Hashim, M., & Hisyam, M. (2006). *Interaksi dalam sistem pengurusan pembelajaran: Satu kajian kes. Universiti Pendidikan Sultan Idris*. Unpublished doctoral dissertation. Universiti Pendidikan Sultan Idris, Malaysia.

Hayashi, A., Chen, C., Ryan, T., & Wu, J. (2004). The role of social presence and moderating role of computer self-efficacy in predicting the continuance usage of e-learning systems. *Journal of Information Systems Education*, *15*(2), 139-154.

Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs*. *76*(4). 408–420.

Hayes, A. F. (2015). An index and test of linear moderated mediation. *Multivariate Behavioral Research, 50*(1), 1–22.

Hayes, A. F., & Scharkow, M. (2013). The relative trustworthiness of inferential tests of the indirect effect in statistical mediation analysis does method really matter?.*Psychological Science*. *24*(10). 1918–1927.

Hayes, D. N. A. (2007). ICT and learning: Lessons from Australian classrooms. *Computers & Education*, *49*(2), 385–395.

Henderson, M., Selwyn, N., & Aston, R. (2017). What works and why? Student perceptions of "useful"digital technology in university teaching and learning. *Studies in Higher Education, 42*(8), 1567-1579.

Henseler, J. (2012). Why generalized structured component analysis is not universally preferable to structural equation modelling. *Journal of the Academy of Marketing Science, 40*(3), 402-413.

Herder, E., & Marenzi, I. (2010). *Trends in Connecting Learners First Research & Technology Scouting Report. STELLAR project deliverable.* Retrieve May 2, 2016, from http://hdl.handle.net/1820/2824.

Hill, F., Mammarella, I. C., Devine, A., Caviola, S., Passolunghi, M. C., & Szűcs, D. (2016). Maths anxiety in primary and secondary school students: gender differences, developmental changes and anxiety specificity. *Learning and Individual Differences*, *48*(1), 45–53.

Hill, J., Nuss, M., Middendorf, B., Cervero, R., & Gaines, J. (2012). Using iPads to enhance teaching and learning in third-year medical clerkships. In *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education* (pp. 1482–1488). Montreal, Quebec, 9 October 2012.

Hinshaw, S. P. (2002). Intervention research, theoretical mechanisms, and causal processes related to externalizing behavior patterns. *Development and Psychopathology*. *14*(4). 789–818.

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. (2013). *Handbook of univariate and multivariate data analysis with IBM SPSS*. Boca Raton, Florida: CRC Press, Taylor and Francis

Hogan, L. (2010). *The Maine learning technology initiative: Professional development at the state, local school district, and classroom l*evels. Retrieve April, 23, 2015 from http://assets.pearsonschool.com/asset_mgr/current/201033/2010_09Hogan.pdf

Hogarty, K. Y., Lang, T. R., & Kromrey, J. D. (2003). Another look at technology use in classrooms: The development and validation of an instrument to measure teachers' perceptions. *Educational and Psychological Measurement*, *63*(1), 139–162.

Holden, H. K. (2009). *Assessing Teachers' Acceptance and Usage Behavior of Current Job-Related Technologies.* ERIC. Unpublished Dissertation, University of Maryland Baltimore, County, Baltimore, MD.

Holden, H., & Rada, R. (2011). Understanding the influence of perceived usability and technology self-efficacy on teachers' technology acceptance. *Journal of Research on Technology in Education*, *43*(4), 343–367.

Holmbeck, G. N. (1997). Toward terminological, conceptual, and statistical clarity in the study of mediators and moderators: examples from the child-clinical and pediatric psychology literatures. *Journal of Consulting and Clinical Psychology*, *65*(4), 599-610.

Holmes Smith, P., Coote, L., & Cunningham, E. (2006). *Structural equation modeling: From the fundamentals to advanced topics.* Melbourne: SREAMS.

Hong, K., Cheng, J. L. A., & Liau, T. (2005). Effects of system's and user's characteristics on e-learning use: A study at Universiti Malaysia Sarawak. *Journal of Science and Mathematics Education in Southeast Asia*, *28*(2), 1-25.

Horan, T. A., Tulu, B., Hilton, B., & Burton, J. (2004). Use of online systems in clinical medical assessments: an analysis of physician acceptance of online disability evaluation systems. In *System Sciences, 2004. Proceedings of the 37th Annual Hawaii International Conference* (p. 10–pp). IEEE.

Horzum, M. B., & Canan Gungoren, O. (2012). A model for beliefs, tool acceptance levels and web pedagogical content knowledge of science and technology preservice teachers towards web based instruction. *Turkish Online Journal of Distance Education*, *13*(3). 50–69.

Hossain, M. M., & Quinn, R. (2014). Pre-service mathematics teachers' perceptions of using Web 2.0 technology for instruction and achievement in a college Euclidean geometry course. *Journal of Research Initiatives, 1*(2), 1-13.

Hou, H.T. (2012). Exploring the behavioral patterns of learners in an educational massively multiple online role-playing game (MMORPG). *Computers & Education*, *58*(4), 1225–1233.

Hoyle, R. H. (2012). *Handbook of structural equation modeling*. New York, NY, USA: Guilford Press.

Hsieh, Y.H., Lin, Y.C., & Hou, H.T. (2016). Exploring the role of flow experience, learning performance and potential behavior clusters in elementary students' game-based learning. *Interactive Learning Environments*, *24*(1), 178–193.

Hsu, M. K., Wang, S. W., & Chiu, K. K. (2009). Computer attitude, statistics anxiety and self-efficacy on statistical software adoption behavior: An empirical study of online MBA learners. *Computers in Human Behavior*, *25*(2), 412–420.

Hu, W., Yang, T., & Matthews, J. N. (2010). The good, the bad and the ugly of consumer cloud storage. *ACM SIGOPS Operating Systems Review*, *44*(3), 110–115.

Huang, W.H. D., Hood, D. W., & Yoo, S. J. (2013). Gender divide and acceptance of collaborative Web 2.0 applications for learning in higher education. *The Internet and Higher Education*, 16*(1)*, 57–65.

Huisman, M., & Iivari, J. (2006). Deployment of systems development methodologies: Perceptual congruence between IS managers and systems developers. *Information & Management*, *43*(1), 29–49.

Hurtz, G. M., & Williams, K. J. (2009). Attitudinal and Motivational Antecedents of Participation in Voluntary Employee Development Activities. *Journal of Applied Psychology*, *94*(3), 635–653.

Hustad, E., & Arntzen, A. A. B. (2013). Facilitating teaching and learning capabilities in social learning management systems: Challenges, issues, and implications for design. *Journal of Integrated Design & Process Science*, *17*(1), 17–35.

Hyde, M., & White, K. (2009). To be a donor or not to be? Applying an extended theory of planned behavior to predict posthumous organ donation intentions. *Journal of Applied Social Psychology*, *39*(4), 880–900.

Ibrahim, R., Yusoff, R. C. M., Khalil, K., & Jaafar, A. (2011). Factors Affecting Undergraduates' Acceptance of Educational Game: An Application of Technology Acceptance Model (TAM). In H. Badioze Zaman et al. (Eds.), *International Visual Informatics Conference* (pp. 135-146). Berlin, Heidelberg : Springer.

Im, K. S., & Grover, V. (2003). The use of structural equation modeling in IS research: review and recommendations. In M.E. Whitman & A.B. Wosczynski (Ed.), *Handbook of Information Systems Research* (pp. 44- 64).Hershey PA, USA: Idea Group Publishing.

Islam, A. K. M. N. (2012) Understanding e-learning systems usage outcomes in hybrid courses. In proceedings of the *45th Hawaii International Conference on System Sciences (HICSS)* (pp. 118-127). Hawaii, United States of America, 4–7 January 2012.

Islam, A. K. M. N. (2013). Investigating e-learning system usage outcomes in the university context. *Computers & Education*, *69*(1), 387–399.

Islam, A. K. M. N. (2015). The moderation effect of user-type (educators vs. students) in learning management system continuance. *Behaviour & Information Technology*, *34*(12), 1160–1170.

Ismail, N. (2015). The Integration of New Media in Schools: Comparing Policy with Practice. *International Education Studies*, *8*(12), 231-240.

Ismail, N., Wan Ali, W. Z., Md Yunus, A.S., & Mohd Ayub, A.F. (2014). The effects of blended learning methods on educational achievement and the development of online material in a Curriculum Information Document Online System (CIDOS) for computer application courses. *Malaysian Journal of Distance Education*, *16*(2), 59–82.

Israel, G. D. (1992). *Determining sample size*. University of Florida Cooperative Extension Service, Institute of Food and Agriculture Sciences, EDIS. Retrieve August 3, 2016, from https://pdfs.semanticscholar.org/0917/

Jackson, J. D., Mun, Y. Y., & Park, J. S. (2013). An empirical test of three mediation models for the relationship between personal innovativeness and user acceptance of technology. *Information & Management*, *50*(4), 154–161.

Jacobs-Israel, M., & Moorefield-Lang, H. (2013). Redefining Technology in Libraries and Schools: AASL Best Apps, Best Websites, and the SAMR Model. *Teacher Librarian*, *41*(2), 16-18.

Jaschik, S., Lederman, D., & Gallup, C. (2014). *The 2013 Inside Higher Ed : Survey of Faculty Attitudes on Technology* (Report No. 8773089956). Retrieved from Gallup University resources: http://commission.fiu.edu/helpful-documents/online-education/12-ihe-survey-faculty-attitudes-on-technology-2013.pdf.

Jashapara, A., & Tai, W.C. (2011). Knowledge mobilization through e-learning systems: Understanding the mediating roles of self-efficacy and anxiety on perceptions of ease of use. *Information Systems Management*, *28*(1), 71–83.

Jenkins, M., Browne, T.,Walker, R., & Hewitt, R. (2011). The development of technology enhanced learning: findings from a 2008 survey of UK higher education institutions. *Interactive Learning Environments*, *19*(5), 447–465.

Jethro, O. O., Grace, A. M., & Thomas, A. K. (2012). E-learning and its effects on teaching and learning in a global age. *International Journal of Academic Research in Business and Social Sciences*, *2*(1), 203-210.

Johnson, R. D., & Marakas, G. M. (2000). Research report: The role of behavioral modeling in computer skills acquisition: toward refinement of the model. *Information Systems Research*, *11*(4), 402–417.

Joiner, R., Gavin, J., Duffield, J., Bronsan, M., Crook, C., Durndell, A., et al. (2005). Gender, Internet identification, and internet anxiety: Correlates of Internet use. *Cyberpsy-chology & Behavior*. *8*(4), 371–378.

Joreskog, K. G. (2007). Factor analysis and its extensions. In R. Cudeck & R.C. MacCallum (Ed.), *Factor Analysis at 100: Historical Developments and Future Directions* (pp. 47-77). Mahwah, N.J: Lawrence Erlbaum Associates Incr.

Jöreskog, K. G., & Sörbom, D. (1984). *LISREL-VI user's guide. Analysis of linear structural relationships by the methods of maximum likelihood.* Chicago: National Education Resources Inc.

Jöreskog, K. G., & Sörbom, D. (1996). *LISREL 8: User's reference guide*. Scientific Software International.

Joreskog, K., Sorbom, D., Du Toit, S., & Du Toit, M. (1999). LISREL 8: New statistical features. Chicago: Scientific Software International. Inc.

Judd, C. M., & Kenny, D. A. (2010). *Data analysis in social psychology: Recent and recurring issues*. Colorado: United States of America: John Wiley & Sons, Inc.

Jude, L. T., Kajura, M. A., & Birevu, M. P. (2014). Adoption of the SAMR Model to Assess ICT Pedagogical Adoption: A Case of Makerere University. *International Journal of E-Education, E-Business, E-Management and E-Learning*, *4*(2), 106–115.

Kanchanatanee, K., Suwanno, N., & Jarernvongrayab, A. (2014). Effects of Attitude toward Using, Perceived Usefulness, Perceived Ease of Use and Perceived Compatibility on Intention to Use E-Marketing. *Journal of Management Research*, *6*, 0–13. doi:10.5296/jmr.v6i3.5573

Kao, F. C., Huang, T. H., & Chang, W. Y. (2009). The Design of Intelligent Decomposed LMS with Improved Ganglia Agent, In D.F. Hsu, & C.M. Huang (Eds.), *Proceedings of the 2009 10th International Symposium on Pervasive Systems, Algorithms, and Networks*, (pp.727-731). Danvers, MA: IEEE.

Kaplan, D. (2008). *Structural equation modeling: Foundations and extensions (Vol. 10)*. Thousands Oaks, California: Sage.

Karaiskos, D. C. (2009). *A predictive model for the acceptance of pervasive information systems by individuals.* Unpublished doctoral dissertation, Athens University of Economics and Business, Greece.

Karakus, T., Inal, Y., & Cagiltay, K. (2008). A descriptive study of Turkish high school students' game-playing characteristics and their considerations concerning the effects of games. *Computers in Human Behavior*, *24*(6), 2520–2529.

Karbach, M. (2012). Eight free tools for teachers to make awesome infographics. Educational Technology and Mobile Learning.

http://www.educatorstechnology.com/2012/05/eight-free-tools-for-teachers-to-make.html.

Karjaluoto, H., Mattila, M., & Pento, T. (2002). Factors underlying attitude formation towards online banking in Finland. *International Journal of Bank Marketing, 20*(6), 261–272.

Kaur, S, Sirat, M., & Azman, N. (2008). The scenario of globalization and internationalization of higher education in Malaysia. In S. Kaur, M. Sirat, & N. Azman (Eds.), *Globalization and internationalization of higher education in Malaysi*a (pp. 3–21). Penang: IPPTN & Universiti Sains Malaysia Press.

Kayode, B.K., Hashim, C.K., (2014). Integrating Information Technology in Teaching and Learning: An Example of a Case Study. In Syed Hassan, S.S., & Hashim, C.N., *Educational Research Trends in ICT*. (pp.15-31) IIUM Press. International Islamic University Malaysia. First Edition.

Keane, T., Keane, W. F., & Blicblau, A. S. (2016). Beyond traditional literacy: Learning and transformative practices using ICT. *Education and Information Technologies, 21*(4), 769-781.

Kenny, D. A., Korchmaros, J. D., & Bolger, N. (2003). Lower level mediation in multilevel models. *Psychological methods, 8*(2), 115-128.

Kenny, D.A. (2014). *Mediation.* Retrieve July 20, 2014 from: htpp://davidakenny.net/cm/mediate.htm.

Kettinger, W. J., & Lee, C. C. (1994). Perceived service quality and user satisfaction with the information services function. *Decision Sciences, 25*(5), 737–766.

Khan Am, W., & Rangsom, K. (2015). Applying Innovation Characteristics in Technology Acceptance Model Innovation Acceptance Model. *International Journal of Applied Computer Technology and Information Systems, 4*(2), 5-9.

Kiili, K. (2007). Foundation for problem-based gaming. *British Journal of Educational Technology, 38*(3), 394–404.

Kim, H. J., & Jang, H. Y. (2015). Motivating Pre-service Teachers in Technology Integration of Web 2.0 for Teaching Internships. *International Education Studies, 8*(8), 21-32.

Kim, H.B., Kim, T., & Shin, S. W. (2009). Modeling roles of subjective norms and eTrust in customers' acceptance of airline B2C eCommerce websites. *Tourism Management, 30*(2), 266–277.

Kim, J. H. (2016). Bias-correction and endogenous lag order algorithm for bootstrap prediction intervals. *Journal of Statistical Planning and Inference, 177*(1), 41–44.

Kim, K. J., Shin, D.H., & Park, E. (2015). Can coolness predict technology adoption? Effects of perceived coolness on user acceptance of smartphones with curved screens. *Cyberpsychology, Behavior, and Social Networking*, *18*(9), 528–533.

Kim, S. W., & Leet, M. G. (2008). Validation of an Evaluation Model for LMSs. *Journal of Computer Assisted Learning*, *24*(4), 284-294.

King, W. R., & He, J. (2006). A meta-analysis of the technology acceptance model. *Information & Management*, *43*(6), 740–755.

Kline, R. B. (2015). *Principles and practice of structural equation modeling*. New York: Guilford publications.

Klobas, J. E., & McGill, T. J. (2010). The role of involvement in learning management system success. *Journal of Computing in Higher Education*, *22*(2), 114–134.

Koç, T., Turan, A. H., & Okursoy, A. (2016). Acceptance and usage of a mobile information system in higher education: An empirical study with structural equation modeling. *The International Journal of Management Education*, *14*, 286–300.

Koch, T., Ortner, T. M., Eid, M., Caspers, J., & Schmitt, M. (2014). Evaluating the construct validity of objective personality tests using a multitrait-multimethod-multioccasion-(MTMM-MO)-approach. *European Journal of Psychological Assessment*. 30(3), 208-230.

Konting, M. M. (2009). *Kaedah penyelidikan pendidikan*. Kuala Lumpur, Malaysia: Dewan Bahasa dan Pustaka.

Krejcie, R. V, & Morgan, D. W. (1970). Table for determining sample size from a given population. *Educational and Psychological Measurement*, *30*(3), 607–610.

Kretschmer, T. (2012). *Information and communication technologies and productivity growth: A survey of the literature.* Paris, France: OECD Publishing.

Krysik, J., & Finn, J. (2013). *Research for effective social work practice*. *New directions in social work.* (3rd Ed.). New York, NY: Routledge.

Kumar, J. A., Muniandy, B., & Yahaya, W. A. J. W. (2014). Exploring the perception and acceptance of Information and Communication Technology (ICT) in the classroom for polytechnic students. *Journal of Teaching and Education*, *3*(3). 175-185.

Kuo, R.Z., & Lee, G.G. (2011). Knowledge management system adoption: Exploring the effects of empowering leadership, task-technology fit and compatibility. *Behaviour & Information Technology*, *30*(1), 113–129.

Kwan, L. S. L., & Yunus, M. M. (2014). Group Participation and Interaction in ESL Wiki Collaborative Writing among Malaysian Gifted Students. *Asian Social Science*, *11*(2), 59-68.

Kwok, W.J., & Neo, T.K. (2015). Utilizing Web 2.0 Tools in a Group Based Learning Environment: A Malaysian Classroom Perspective. *International Journal of Social Science and Humanity*, *5*(3), 311-315.

Lai, A., & Savage, P. (2013). Learning Management Systems and Principles of Good Teaching: Instructor and Student Perspectives. *Canadian Journal of Learning and Technology*, *39*(3), 1-21.

Lai, C. (2015). Modeling teachers' influence on learners' self-directed use of technology for language learning outside the classroom. *Computers & Education*, *82*(1),74–83.

Lallmahamood, M. (2007). An Examination of Individual's Perceived Security and Privacy of the Internet in Malaysia and the Influence of This on Their Intention to Use E-Commerce: Using An Extension of the Technology Acceptance Model. *Journal of Internet Banking and Commerce*, *12*(3), *1-26.*

Lan, Y.F., Tsai, P.W., Yang, S.H., & Hung, C.L. (2012). Comparing the social knowledge construction behavioral patterns of problem-based online asynchronous discussion in e/m-learning environments. *Computers & Education, 59*(4), 1122–1135.

Landau, R.H., Paez, M.J., Bordeianu, C., & Haerer, S. (2011). Making physics education more relevant and accessible via computation and e-text books. *Computer Physics Communications*, *182* (9), 2071–2075.

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

Lau, Y., Tha, P. H., Wong, D. F. K., Wang, Y., Wang, Y., & Yobas, P. K. (2016). Different perceptions of stress, coping styles, and general well-being among pregnant Chinese women: a structural equation modeling approach. *Archives of Women's Mental Health*, *19*(1), 71–78.

Learning Management System 2.5 (2015). *Manual pengguna pelajar: Learning Management System Version 2.5.* 1-32. Retrieved from http://portal.cidos.edu.my

Lee, C., & Tsai, F. (2004). Internet project-based learning environment: The effects of thinking styles on learning transfer. *Journal of Computer Assisted Learning*, *20*(1), 31–39.

Lee, C.H, Chan, J.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 *proceedings of the International*

Conference on e-Learning (p. 251-258). Academic Conferences International Limited, 1-2 June 2012.

Lee, CH., 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 and Education*, *61*(1), 193–208.

Lee, K. S., Lee, H. S., & Kim, S. Y. (2007). Factors Influencing the Adoption Behavior of Mobile Banking: A South Korean perspective. *Journal of Internet Banking & Commerce*, *12*(2).

Lee, R.Z. K.G. (2011). Knowledge management system adoption: Exploring the effects of empowering leadership, task-technology fit and compatibility. *Behaviour & Information Technology*, *30*(1), 113–129.

Lee, Y. H., Hsiao, C., & Purnomo, S. H. (2014). An empirical examination of individual and system characteristics on enhancing e-learning acceptance. *Australasian Journal of Educational Technology*, *30*(5), 562–579.

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

Leech, N., Barrett, K., & Morgan, G. (2008). *SPSS for Intermediate Statistics: Use and Interpretation. N*ew York: Taylor and Francis Group, LLC.

Legris, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*, *40*(3), 191–204.

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

Leonard, D.A., & DeLacey, B.J. (2002). Case study on technology and distance in education at the Harvard Business School. *Educational Technology and Society*, *5*(2), 13–28.

Lepper, M. R. (1985). Microcomputers in education: Motivational and social issues. *American Psychologist*, *40*(1), 1–18.

Leslie, S. (2004). *Open source course management systems, EdTechPost Blog*. Retrieved Sept. 5, 2005 from: http://www.edtechpost.ca/mt/archive/cat_learning_objects.htm

Leu, D. J., Everett-Cacopardo, H., Zawilinski, J., Mcverry, G., & O'Byrne, W. I. (2013). *New Literacies of Online Reading Comprehension. The Encyclopedia of Applied Linguistics.* New York, NY: Wiley.

Levy, P. S., & Lemeshow, S. (2013). *Sampling of populations: methods and applications*. (4th Ed.). Hoboken, NJ: John Wiley & Sons.

Lewis, B. A., MacEntee, V. M., DeLaCruz, S., Englander, C., Jeffrey, T., Takach, E., & Woodall, J. (2005). Learning management systems comparison. In *Proceedings of the 2005 Informing Science and IT Education Joint Conference* (pp. 17–29). Flagstaff, Arizona, United States of America, 16-19 June 2005.

Lewis, M. L., Weber, R., & Bowman, N. D. (2008). "They may be pixels, but they're MY pixels:" Developing a metric of character attachment in role-playing video games. *CyberPsychology & Behavior, 11*(4), 515–518.

Liao, H., & Liu, S. (2012). A Comparison Analysis on the Intention to Continued Use of a Lifelong Learning Website. *International Journal of Electronic Business Management, 10*(3), 213-223.

Liao, H.L., & Lu, H.P. (2008). The role of experience and innovation characteristics in the adoption and continued use of e-learning websites. *Computers & Education, 51*(4), 1405–1416.

Liaw, S.S. (2008). Investigating students' perceived satisfaction, behavioral intention, and effectiveness of e-learning: A case study of the Blackboard system. *Computers & Education, 51*(2), 864–873.

Library Journal. (2011). *E-book Penetration & Use in U.S. Academic Libraries.* New York: Library Journal.

Limayem, M., & Cheung, C. M. (2008). Understanding information systems continuance: The case of Internet-based learning technologies. *Information & management, 45*(4), 227-232.

Lin, C. S. (2017). Untangling the relationship between strategic consistency and organizational performance: An empirical analysis of moderator variables. *Journal of Management & Organization, 23*(4), 483-503.

Lin, F., Fofanah, S.S. & Liang, D., (2011). 'Assessing citizen adoption of e-Government initiatives next term in Gambia: A validation of the technology acceptance model in information systems success'. *Government Information Quarterly* 28(2), 271– 279.

Lin, K.M. (2011). e-Learning continuance intention: Moderating effects of user e-learning experience. *Computers & Education, 56*(2), 515–526.

Liska, A. E. (1984). A critical examination of the causal structure of the Fishbein/Ajzen attitude-behavior model. *Social Psychology Quarterly, 47*(1), 61–74.

Liu, C. H., & Huang, Y. M. (2015). An empirical investigation of computer simulation technology acceptance to explore the factors that affect user intention. *Universal Access in the Information Society*, *14*(3), 449–457.

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.

Livingstone, S. (2012). Critical reflections on the benefits of ICT in education. *Oxford Review of Education*, *38*(1), 9–24.

Loehlin, J. C., & Beaujean, A. A. (2016). *Latent variable models: An introduction to factor, path, and structural equation analysis*. (5th Ed.). New York, NY: Taylor & Francis.

Lomax, R. G., & Schumacker, R. E. (2012). *A beginner's guide to structural equation modeling*. New York: Routledge Academic.

Lonn, S., Teasley, S. D., & Krumm, A. E. (2011). Who needs to do what where? Using learning management systems on residential vs. commuter campuses. *Computers & Education*, 56(3), 642-649.

Loo, C. K., Liew, W. S., Seera, M., & Lim, E. (2015). Probabilistic ensemble Fuzzy ARTMAP optimization using hierarchical parallel genetic algorithms. *Neural Computing and Applications*, *26*(2), 263–276.

Loon, L. K., Mun, C. C., Kang, T. Y., Rui, S. C. S., Ping, L. W., & Tung, M. C. V. (2016). Factors Affecting Students' Acceptance of SMART2 Learning Management System In N. Mohd Suki (Ed.), *Handbook of Research on Leveraging Consumer Psychology for Effective Customer Engagement* (pp. 154-182). United States of America : Business Science Reference.

Lowther, D. L., Ross, S. M., & Morrison, G. M. (2003). When each one has one: The influences on teaching strategies and student achievement of using laptops in the classroom. *Educational Technology Research and Development*, *51*(3), 23–44.

Lu, J., Yu, C.S., Liu, C., & Yao, J. E. (2003). Technology acceptance model for wireless Internet. *Internet Research: Electronic Networking Applications and Policy*, *13*(3), 206–222.

Luan, W. S., Atan, H., & Sabudin, S. (2010). Exploring teachers' perceptions of their pedagogical role with computers: A case study in Malaysia. *Procedia-Social and Behavioral Sciences*, *2*(2), 388–391.

Luce, R. D., & Tukey, J. W. (1964). Simultaneous conjoint measurement: A new type of fundamental measurement. *Journal of Mathematical Psychology*, *1*(1), 1-27.

Luckin, R., Clark, W., Garnett, F., Whitworth, A., Akass, J., Cook, J., Robertson, J. (2010). Learner-generated contexts: A Framework to support the effective use of technology for learning. In M.J.W. Lee & C. McLoughlin (Eds.), *Web 2.0-Based E-Learning: Applying Social Informatics for Tertiary Teaching: Applying Social Informatics for Tertiary Teaching* (1st ed.) (pp.70-84). Hershey, NY: Information Science Reference.

Lucko, G., & Rojas, E. M. (2010). Research validation: Challenges and opportunities in the construction domain. *Journal of Construction Engineering and Management*, *136*(1), 127–135.

Lunati, S. (2012, November 27). Routine and interface for correcting electronic text. Google Patents.

Lwoga, E.T. (2013), Measuring the success of library 2.0 technologies in the African context: the suitability of the DeLone and McLean's model. *Campus-Wide Information Systems*, *30*(4), 288-307.

Lyashenko, M. S., & Frolova, N. H. (2014). LMS projects: A platform for intergenerational e-learning collaboration. *Education and Information Technologies*, *19*(3), 495–513.

MacCallum, R. C., & Austin, J. T. (2000). Applications of structural equation modeling in psychological research. *Annual Review of Psychology*, *51*(1), 201-226.

MacKinnon, D. P., & Dwyer, J. H. (1993). Estimating mediated effects in prevention studies. *Evaluation Review. 17*(2). 144–158.

MacKinnon, D. P., & Fairchild, A. J. (2009). Current directions in mediation analysis. *Current directions in psychological science*, *18*(1), 16-20.

MacKinnon, D. P., Krull, J. L., & Lockwood, C. M. (2000). Equivalence of the mediation, confounding and suppression effect. *Prevention science*, *1*(4), 173-181.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods*, *7*(1), 83-104.

MacLean, S., Gray, K. (1998). Structural Equation Modeling in Market Research. *Journal of the Australian Market Research Society*, *4*(3), 111-119.

Madorin, S., & Iwasiw, C. (1999). The effects of computer-assisted instruction on the self-efficacy of baccalaureate nursing students. *Journal of Nursing Education*, *38*(6), 282–285.

Mahdizadeh, H., Biemans, H., & Mulder, M. (2008). Determining factors of the use of e-learning environments by university teachers. *Computers & Education*, *51*(1), 142-154.

Malaysia Educational Blueprint (2013). Blueprint 2013-2025. (n.d). *Ministry of Education, Malaysia*. *Putrajaya*: Retrieve September 2, 2005, from http://www.moe.gov.my/userfiles/file/MEB/ Malaysian-Educational-Blueprint.pdf.

Malaysian Polytechnic Individual Score Card (BLX) (2015). Kementerian Pendidikan Tinggi Malaysia. Jabatan Pengajian Politeknik. Bahagian Instruksional dan Pembelajaran. Putrajaya: Retrieved from http://portal.cidos.edu.my/malaysian-polytechnic-BLX-2015.pdf.

Mamat, I., Yusoff, A. S. M., Abdullah, W. S. W., & Razak, F. Z. A. (2015). Factors Contributing Pre-School Trainees Teachers Adoption of Virtual Learning Environment: Malaysian Evidence. *Turkish Online Journal of Educational Technology*, *14*(2), 73-79.

Maqsood, T., Finegan, A., & Walker, D. (2006). Applying project histories and project learning through knowledge management in an Australian construction company. *The Learning Organization*, *13*(1), 80-95.

Marakas, G., Yi, M., & Johnson, R. (1996). The multilevel construct of computer self-efficacy: an empirical investigation at the general and task-specific levels. In *Association of Information , ICIS Proceedings* (pp. 471-473). University of Marryland, College Park, 31 December 1996.

Marcinkiewicz, H.R., & Regstad, N.G. (1996). Using subjective norms to predict teachers' computer use. *Journal of Computing in Teacher Education*, 13(1), 27–33.

Markus, M. L., and M. S. Silver. (2008). A Foundation for The Study of IT Effects: A New Look at DeSanctis and Poole's Concepts of Structural Features and Spirit.*Journal of the Association for Information Systems*, *9*(10). 609-632.

Masrom, M. (2007). Technology Acceptance Model and e-learning. In proceedings of the *12th International Conference on Education,* (pp. 1-10). Sultan Hassanal Bolkiah Institute of Education Universiti Brunei Darussalam, 21-24 May 2007.

Masrom, M. (2007). Technology acceptance model and e-learning. *Technology*, *21*(24), 81.

Mathew, B. (2014). Using a social networking tool for blended learning in staff training: Sharing experience from practice. *Journal of Neonatal Nursing*, *20*(3), 90–94.

Maxfield, M. G., & Babbie, E. R. (2014). *Research methods for criminal justice and criminology*. Belmont, CA: Nelson Education.

Mayberry, J., Hargis, J., Meler, M., Boles, L., Dugas, A., O'Neill, D., & Rivera, A. (2012). New faculty explore teaching and learning in higher education using an iTouch. *Journal of Active Learning in Higher Education, 13* (3), 45-61.

Mc Millan, J., & Schumacher, S. (2010). Research in education evidence-based inquiry (7th ed.). New Jersey: Pearson Education, Inc.

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

McGill, T.J., Klobas, J.E., & Renzi, S. (2011). LMS use and instructor performance: The Role of Task technology fit. *International Journal on E-Learning*, 10(1), 43–62.

McLoughlin, C., & Lee, M. J. W. (2010). Personalised and self-regulated learning in the Web 2.0 era: International exemplars of innovative pedagogy using social software. *Australasian Journal of Educational Technology*, *26*(1), 28–43.

McMillan J.H., & Schumacher, S. (2014). *Research in education: Evidence-based inquiry* (6th ed). Boston, MA: Pearson Education.

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

Md Yunus, M. & Suliman, A., (2014). Information and Communication Technology (ICT) Tools in Teaching and Learning Literature Component in Malaysia Secondary School. *Asian Social Science*. *10*(7). 136-152.

Melhuish, K., & Falloon, G. (2010). Looking to the future: M-learning with the iPad. *Computers in New Zealand Schools: Learning, Leading, Technology, 22*(3), 1–16.

Merhi, M. I. (2015). Factors influencing higher education students to adopt podcast: An empirical study. *Computers & Education*, *83*(1), 32–43.

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

Michinov, N., Brunot, S., Le Bohec, O., Juhel, J., & Delaval, M. (2011). Procrastination, participation, and performance in online learning environments. *Computers & Education*, *56*(1), 243–252.

Ming, T. S., Murugaiah, P., Wah, L. K., Azman, H., Yean, T. L., & Sim, L. Y. (2010). Grappling with technology: A case of supporting Malaysian Smart School teachers' professional development. *Australasian Journal of Educational Technology*, *26*(3), 400–416.

Ministry of Education Malaysia. (2007a). ICT literacy for secondary school guideline. Curriculum Development Division, Ministry of Education Malaysia, Government Complex Parcel E, Putrajaya.

Ministry of Education Malaysia. (2007b). Pelan induk pembanggunan pendidikan (PIPP) 2006-2010 (RMK-9). Putrajaya.

Ministry of Education Malaysia. (2010). Policy on ICT in Education Malaysia. Putrajaya: Ministry of Education.

Ministry of Education Malaysia. (2012a). Pelan strategik interim Kementerian Pelajaran Malaysia 2011-2020. Bahagian Perancangan dan Penyelidikan Dasar Pendidikan, Kementerian Pelajaran Malaysia.

Ministry of Education Malaysia. (2012b). Preliminary report: Malaysia education blueprint 2013-2025. Putrajaya, Malaysia.

Miranda, S. M., & Bostrom, R. P. (1993). The impact of group support systems on group conflict and conflict management. *Journal of Management Information Systems*, *10*(3), 63–95.

Misra, S. C., & Mondal, A. (2011). Identification of a company's suitability for the adoption of cloud computing and modelling its corresponding return on investment. *Mathematical and Computer Modelling*, *53*(3), 504–521.

Moallem, M. (2008). Accommodating individual differences in the design of online learning environment. *Journal of Research on Technology in Education*, *40*(2), 217–245.

Moeller, B., & Reitzes, T. (2011). *Integrating Technology with Student-Centered Learning. A Report to the Nellie Mae Education Foundation. Inc.* Newton, MA: *Education Development Center.*

Moeller, S., Spitzer, K., & Spreckelsen, C. (2010). How to configure blended problem based learning: Results of a randomized trial. *Medical Teacher*, *32*(8), 328–346.

Mohamad, S. N. A., Embi, M. A., & Nordin, N. M. (2015). Are Students Ready to Adopt E-Portfolio? Social Science and Humanities Context. *Asian Social Science*, *11*(13), 269-275.

Mohamad, S. N. A., Embi, M. A., & Nordin, N. M. (2015). Designing Project-Based Learning (PjBL) Activities for Art and Design E-Portfolio Using Fuzzy Delphi Method as a Decision Making. *Asian Social Science*, *11*(28), 45.

Mohamad, S. N. M., Salam, S., & Bakar, N. (2014). Lecturers' Perceptions and Attitudes Towards the Usage of Online Learning at Polytechnic. *International Journal of Science Commerce and Humanities*, *2*(1), 169-172.

Mohd Ariffin, Abd Rahman, Alias & Sardi, 2014, A Survey on Factors Affecting the Utilization of a Learning Management System (LMS) In F.H. Yusoff (Eds.), *A Malaysian Higher Education, IEEE Conference of e-Learning, e-Management and e-Services(IC3E)* (pp 82-87). Hawthorn: Australia.

Monthly Hits Report (2014). *CIDOS usage among lecturers and students. Politeknik Merlimau, Melaka.* Ministry of Higher Education. Department of Polytechnic Studies. Retrieved from http://portal.cidos.edu.my

Moon, J.W., & Kim, Y.G. (2001). Extending the TAM for a World-Wide-Web context. *Information & Management*, *38*(4), 217–230.

Morimoto, H., Shimada, H., & Ozaki, K. (2014). Sociocultural beliefs, as well as goodness of fit, influence the effectiveness of coping in Japanese workers. *International Journal of Behavioral Medicine*, *21*(3), 447–455.

Morphy, P., & Graham, S. (2012). Word processing programs and weaker writers/readers: A meta-analysis of research findings. *Reading and Writing*, *25*(3), 641–678.

Morrison, E. W. (1993). Newcomer information seeking: Exploring types, modes, sources, and outcomes. *Academy of Management Journal*, *36*(3), 557–589.

Moses, P. (2012). *Predictors of laptop use in teaching and learning among secondary school mathematics and science teachers.* Unpublished doctoral dissertation. Faculty of Educational Studies, Universiti Putra Malaysia, Malaysia.

Moses, P., Khambari, M.N., & Luan, W. S. (2008). Laptop use and its antecedents among educators: a review of the literature. *European Journal of Social Sciences*, *7*(1), 104–114.

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*(1), 158–167.

Mousavi, S. N., & Golestani, M. (2016). The Effect of Internal Branding on Brand Performance with Moderator Role of Job Satisfaction. *Journal of Administrative Management, Education and Training*, *12*(4), 681–689.

Muijs, D. (2010). *Doing quantitative research in education with SPSS*. Thousand Oaks, CA: Sage.

Multimedia Super Corridor (MSC) (2010a). MSC Malaysia smart school flagship application. Retrieved Mar. 30, 2010, from http://www.mscmalaysia.my/smartschool/overview MSC. (2010b). MSC Malaysia: National ICT initiative. Retrieved Mar. 30, 2010, from http://www.mscmalaysia.my/

Multimedia Super Corridor (MSC). (2005). The smart school roadmap 2005-2020: An educational odyssey.

Mun, Y. Y., & Hwang, Y. (2003). Predicting the use of web-based information systems: Self-efficacy, enjoyment, learning goal orientation, and the Technology Acceptance Model. *International Journal of Human-Computer Studies*, *59*(4), 431–449.

Mun, Y. Y., Jackson, J. D., Park, J. S., & Probst, J. C. (2006). Understanding information technology acceptance by individual professionals: Toward an integrative view. *Information & Management*, *43*(3), 350–363.

Mutula, S M. 2013. Ethical Dimension of the Information Society: implications for Africa. In D. Ocholla, J. Britz, R. Capurro & C. Bester (Eds.), *Information*

Ethics in Africa: Cross Cutting Themes (pp.29-42). Pretoria, South Africa: African Centre of Excellence for Information Ethics.

Nagy, J. T. (2016). Using learning management systems in business and economics studies in Hungarian higher education. *Education and Information Technologies*, *21*(4), 897-917.

Narver, J. C., Slater, S. F., & MacLachlan, D. L. (2004). Responsive and proactive market orientation and new-product success. *Journal of Product Innovation Management*, *21*(5), 334–347.

Navarro Sada, A., & Maldonado, A. (2007). Research Methods in Education. -by Louis Cohen, Lawrence Manion and Keith Morrison. *British Journal of Educational Studies*, *55*(4), 469–470.

Naveh, G., Tubin, D., & Pliskin, N. (2010). Student LMS use and satisfaction in academic institutions: The organizational perspective. *The Internet and Higher Education*, *13*(3), 127–133.

Nguyen, L., Barton, S. M., & Nguyen, L. T. (2015). Ipads in higher education—hype and hope. *British Journal of Educational Technology*, *46*(1), 190–203.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science*, *5*(1), 14–37.

Nunnally J (1978). *Psychometric theory*. New York: McGraw-Hill.

Nurul, S., Mohamad, M., Salam, S., & Bakar, N. (2014). Lecturers ' Perceptions and Attitudes Towards the Usage of Online Learning at Polytechnic. *International Journal of Science Commerce and Humanities*, *2*(1), 43-51.

Nyerges, T., Jankowski, P., & Drew, C. (2002). Data-gathering strategies for social-behavioural research about participatory geographical information system use. *International Journal of Geographical Information Science*, *16*(1), 1–22.

Okello-Obura, C., & Ssekitto, F. (2015). Web 2.0 technologies application in teaching and learning by Makerere University academic staff. *Library Philosophy and Practice*, *1*(1), 1-23.

Okyere-Kwakye, E., Md Nor, K., & Ologbo, A. C. (2016). Technology Acceptance: Examining the Intentions of Ghanaian Teachers to Use Computer for Teaching. *African Journal of Library, Archives & Information Science*, *26*(2), 117-130.

Okyere-Kwakye, E., Md Nor, K., & Ologbo, A. C. (2016). Technology Acceptance: Examining the Intentions of Ghanaian Teachers to Use Computer for Teaching. *African Journal of Library, Archives & Information Science*, *26*(2).

Ollman, B. (1976). *Alienation: Marx's conception of man in a capitalist society*. Cambridge University Press.

Ong, C.S., & Lai, J.Y. (2006). Gender differences in perceptions and relationships among dominants of e-learning acceptance. *Computers in Human Behavior*, *22*(5), 816–829.

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

Orlikowski, W. J. (1992). The duality of technology: Rethinking the concept of technology in organizations. *Organization Science*, *3*(3), 398–427.

Orlikowski, W. J., & Robey, D. (1991). Information technology and the structuring of organizations. *Information Systems Research*, *2*(2), 143–169.

Orlikowski, W. J., & Yates, J. (1994). Genre repertoire: The structuring of communicative practices in organizations. *Administrative Science Quarterly*, 541–574.

Osang, F. B., Abinwi, N., & Tsuma, C. (2015). Reviewing information systems usage and performance models. *International Journal of Computer Science and Information Technologies,(IJCSIT).*, *6*(1). 476-484.

Osborne, J. W. *and* Overbay, A. (2004). The power of outliers (and why researchers should always check for them). *Practical Assessment, Research and Evaluation. 9*(6).1–12.

Owston, R., Widerman, H., Sinitskaya Ronda, N., & Brown, C. (2009). Computer game development as a literacy activity. *Computers & Education*, 53(3), 977–989.

Pallant, J. (2013). *SPSS survival manual: A step by step guide to data analysis using IBM SPSS. Fifth Edition.* Berkshire, United Kingdom: McGraw Hill.

Pallant, J.(2010*). SPSS survival manual: A step by step guide to data analysis using SPSS for Windows (Version 12). Second edition*. New York: McGraw Hill.

Panda, S., & Mishra, S. (2007). E-Learning in a Mega Open University: Faculty attitude, barriers and motivators. *Educational Media International*, *44*(4), 323-338.

Pandiyan, B. M., & Singhal, M. (2015). Development of a Lightweight Learning Management System using Open Source Software Drupal. *Journal of Current Trends in Library and Information Science*, *1*(1), 1-5.

Paragina, F., Paragina, S., & Jipa, A. (2010). E–learning A New Trend in Teachers Training Activities. *Conference Proceedings of E-Learning and Software for Education, 1*(1), 115–118.

Paraskeva, F.,Mysirlaki, S., & Papagianni, A. (2010). Multiplayer online games as educational tools: Facing new challenges in learning. *Computer & Education*, 54(2), 498-505.

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988). Servqual. *Journal of Retailing*, *64*(1), 12–40.

Park, E., Kim, H., & Ohm, J. Y. (2015). Understanding driver adoption of car navigation systems using the extended technology acceptance model. *Behaviour & Information Technology*, *34*(7), 741–751.

Park, S. Y. (2009). An Analysis of the Technology Acceptance Model in Understanding University Students' Behavioral Intention to Use e-Learning. *Educational Technology & Society*, *12*(3), 150–162.

Park, S. Y., Nam, M., & Cha, S. (2012). University students' behavioral intention to use mobile learning: Evaluating the technology acceptance model. *British Journal of Educational Technology*, *43*(4), 592–605.

Pauleen, D., Agnihotri, R., & Troutt, M. D. (2009). The effective use of technology in personal knowledge management: A framework of skills, tools and user context. *Online Information Review*, *33*(2), 329–342.

Pearse, N. 2011. Deciding on the scale granularity of response categories of Likert type scales: The case of the 21-point scale. *The Electronic Journal of Business Research Methods, 9*(2), 159-171.

Peng, H., Tsai, C., & Wu, Y. (2006). University students' self-efficacy and their attitudes toward the Internet: The role of students' perceptions of the Internet. *Educational Studies*. *32*(1), 73–86.

Peng, Y. (2008). Intelligent content push for SCORM-based E-Learning systems. In *Proceedings 2nd 2008 International Symposium on Intelligent Information Technology Application Workshop, IITA 2008 Workshop* (pp. 239–242). Shang Hai, China, 21-22 Decemebr 2008.

Penketh, C., & Beaumont, C. (2014). "Turnitin said it wasn"t happy': Can the regulatory discourse of plagiarism detection operate as a change artefact for writing development? *Innovations in Education and Teaching International*, *51*(1), 95–104.

Perez Fontan, F., Jeannin, N., Mametsa, H. J., Castanet, L., & Lacoste, F. (2011). Physical-statistical model for the LMS channel at Ku/Ka band. In *proceedings of the 5th European Conference on Antennas and Propagation (EUCAP)* (pp. 3571-3575). Rome, Italy, 11-15 April 2011

Pérez, J. C. N., Menéndez, R. C., Gutiérrez, A. B. B., Rosário, P., Alba, M. E. F., & Fernández, N. S. (2011). Implementation of training programs in self-regulated learning strategies in Moodle format: Results of a experience in higher education. *Psicothema*, *23*(2), 274–281.

Perez, O. A., Gonzalez, V., Pitcher, M. T., Golding, P., Gomez, H., & Espinoza, P. A. (2012). Analysis of mobile technology impact on stem based courses; Specifically Introduction To Engineering In The Era of the Ipad. In *American*

Society for Engineering Education. American Society for Engineering Education.

Peterson, C. H., Gischlar, K. L., & Peterson, N. A. (2017). Item construction using reflective, formative, or Rasch measurement models: Implications for group work. *The Journal for Specialists in Group Work*, *42*(1), 17–32.

Piaw, C. Y. (2011). *Kaedah Penyelidikan* (Edisi Kedua). Serdang: McGraw-Hill (Malaysia) Sdn. Bhd.

Pilgrim, J., Bledsoe, C., & Reily, S. (2012). New technologies in the classroom. *Delta Kappa Gamma Bulletin*, *78*(4), 16–22.

Piña, A. A. (2012). An overview of learning management systems. In H. Probst & E. Gallagher (Eds.), *Virtual Learning Environments: Concepts, Methodologies, Tools and Applications* (pp. 33–51). Sullivan University System, USA: IGI Global.

Pinsonneault, A., & Pozzebon, M. (2001). Structuration Theory in the IS Field: An Assessment of Research Strategies. In *9th European Conference of Information Systems* (pp. 205–217). Bled, Slovenia, 27-29 June 2001.

Piotrowski, M. (2010). What is an e-learning platform. In Kats Y. (Ed.), *Learning Management System Technologies and Software Solutions for Online Teaching: Tools and Applications* (pp. 20–36). United States of America: Information Science Reference.

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

Pool, J. K., Arabzad, S. M., Asadi, A., & Ansari, M. R. (2015). RFID acceptance in SMEs using TOE framework: an empirical investigation on Iranian SMEs. *International Journal of Logistics Systems and Management*, *21*(3), 335–347.

Poole, M. S. (1990). *Organizations and Communication Technology*, London, UK: Sage Publications.

Poole, M. S., & DeSanctis, G. (2004). Structuration Theory in Information Systems Research. *The Handbook of Information Systems Research*, *6245*, 206–249. doi:10.4018/978-1-59140-144-5.ch013

Poole, M. S., & McPhee, R. D. (1983). A structurational analysis of organizational climate. *Communication and Organizations: An Interpretive Approach*, *195*, 220.

Poole, M. S., Holmes, M., & DeSanctis, G. (1991). Conflict management in a computer-supported meeting environment. *Management Science*, *37*(8), 926–953.

Poon, J. (2013). Blended learning: An institutional approach for enhancing students' learning experiences. *Journal of Online Learning and Teaching*, *9*(2), 271-289.

Popescu, E. (2014). Providing collaborative learning support with social media in an integrated environment. *Journal of World Wide Web*, *17*(2), 199–212.

Portal Rasmi Politeknik Malaysia (2015). Kementerian Pendidikan Tinggi, Jabatan Pendidikan Politeknik, dicapai melalui www.politeknik.edu.my.

Porter, W. W., Graham, C. R., Spring, K. A., & Welch, K. R. (2014). Blended learning in higher education: Institutional adoption and implementation. *Computers & Education*, *75*(1), 185–195.

Preliminary Report-Executive Summart (2012). Malaysia Education Blueprint 2013-2025. Ministry of Education Malaysia. Retrieved June 18, 2016 from http://planipolis.iiep.unesco.org/upload/Malaysia/Malaysia_Preliminary_Blueprint_summary.pdf

Puentedura, R. (2006). *Transformation, Technology, and Education*. Retrieve February 18, 2015, from: http://hippasus.com/resources/tte/puentedura_tte.pdf

Puentedura, R. (2010). *SAMR and TPCK: Intro to advanced practice*. Retrieve February 12, 2013, from http://hippasus.com/resources/sweden2010/SAMR_TPCK_

Puentedura, R. R. (2012). *The SAMR model: Background and exemplars*. *Retrieve June 24*, 2014, from http://www.hippasus.com/rrpweblog/archives/2012/08/23/

Puentedura, R. R. (2013, January 7). *Technology in education: A brief introduction* [video]. Retrieved from Ruben R. Puentedura's blog at www.hippasus.com/rrpweblog/archives/000080.html.

Puentedura, R. R. (2015). SAMR and TPCK: A Hands-On Approach to Classroom Practice. In *Presentation slides presented at the 1C Learning Conference, Hong Kong. Retrieved* (Vol. 28).

Puentedura, R.R. (2013, May 29). SAMR: Moving from enhancement to transformation

Puteh, M. (2007). E-learning in Malaysian 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). Senai, Johor Bahru, Malaysia, 2-5 November 2007.

Pynoo, B., Devolder, P., Duyck, W., Van Braak, J., Sijnave, B., & Duyck, P. (2012). Do hospital physicians' attitudes change during PACS implementation? A cross-sectional acceptance study. *International Journal of Medical Informatics*, *81*(2), 88–97.

Quinn, C. N. (2011). *Designing mLearning: Tapping into the mobile revolution for organizational performance*. John Wiley & Sons. San Francisco, CA: Pfieffer

Rabah, J. (2015). Benefits and Challenges of Information and Communication Technologies (ICT) Integration in Québec English Schools. *Turkish Online Journal of Educational Technology*, *14*(2), 24.

Rabow, J., Neuman, C. A., & Hernandez, A. C. R. (1987). Contingent consistency in attitudes, social support and the consumption of alcohol: Additive and interactive effects. *Social Psychology Quarterly*, 56–63.

Raman, A., & Annamalai, V. (2011). Web services and e-shopping decisions: A study on Malaysian e-consumer. *IJCA Special Issue on "Wireless Information Networks & Business Information System" WINBIS*, *1*(1), 54–60.

Ramorola, M. Z. (2013) Challenge of effective technology integration into teaching and learning, *Africa Education Review*, 10(4), 654-670.

Raoprasert, T., & Islam, S. M. N. (2010). Structural Equation Modeling: Results and Analysis. In T. Raoprasert & S.M.N. Islam (Eds.). *Designing an Efficient Management System* (pp. 111–147). Heidelberg: Physica-Verlag HD.

Razak, A. (2010). *Improvement in e-learning in term of communication.* (Unpublished master's thesis, Universiti Teknologi Malaysia, Malaysia).

Razali, S. N., & Shahbodin, F. (2014). The usage of CIDOS and social network sites in teaching and learning processes at Malaysian polytechnics. *International Journal of Computers And Technology*, *13*(4), 4354–4359.

Razali, S. N., Shahbodin, F., Bakar, N., Hussin, H., Ahmad, M. H., & Sulaiman, N. (2013). Incorporating Learning Management System with Social Network Sites to Support Online Collaborative Learning: Preliminary Analysis. *Advances in Visual Informatics*, *8237*, 549–557.

Reiser, M., Yao, L., Wang, X., Wilcox, J., & Gray, S. (2017). A Comparison of Bootstrap Confidence Intervals for Multi-level Longitudinal Data Using Monte-Carlo Simulation. In D.G. Chen & J.D Chen (Ed.). *Monte-Carlo Simulation-Based Statistical Modeling* (pp. 367–403). United States of America: Springer.

Reiss, M., & Steffens, D. (2010). Hybrid toolboxes: Conceptual and empirical analysis of blending patterns in application of hybrid media. *Technological and Economic Development of Economy*, *16*(2), 305–326.

Ringle, C. M., Sarstedt, M., & Straub, D. W. (2012). A critical look at the use of PLS-SEM in MIS Quarterly. *MIS Quarterly*, *36*(1), 3-16.

Ritzhaupt, A. D., Dawson, K., & Cavanaugh, C. (2012). An investigation of factors influencing student use of technology in K-12 classrooms using path analysis. *Journal of Educational Computing Research*, *46*(3), 229–254.

Roblyer, M. D., & Doering, A. H. (2010). *Integrating educational 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.

Roca, J. C., & Gagné, M. (2008). Understanding e-learning continuance intention in the workplace: A self-determination theory perspective. *Computers in Human Behavior, 24*(4), 1585–1604.

Roca, J. C., Chiu, C.M., & Martínez, F. J. (2006). Understanding e-learning continuance intention: An extension of the Technology Acceptance Model. *International Journal of Human-Computer Studies, 64*(8), 683–696.

Rockinson Szapkiw, A. J., Courduff, J., Carter, K., & Bennett, D. (2013). Electronic versus traditional print textbooks: A comparison study on the influence of university students' learning. *Computers & Education, 63*, 259–266.

Rogers, E.M (1995). *Diffusion of innovations*, New York, United States of America : The Free Press.

Romli, R. (2013). *Implementation of CIDOS (e-learning) among Diploma in Accountancy students in Politeknik Sultan Abdul Halim.* (Master's thesis, Universiti Utara Malaysia).

Romrell, D., Kidder, L. C., & Wood, E. (2014). The SAMR Model as a Framework for Evaluating mLearning. *Journal of Asynchronous Learning Networks, 18*(2), 1-15.

Rose, J. (1998). Evaluating the contribution of structuration theory to the information systems discipline. In *6th European Conference on Information Systems* (pp. 910–924).

Rotherham, A., & Willingham, D. (2010). 21st-century skills: Not new, but a worthy challenge. *American Educator, 1*(1), 17–20.

Rucker, D. D., Preacher, K. J., Tormala, Z. L., & Petty, R. E. (2011). Mediation analysis in social psychology: Current practices and new recommendations. *Social and Personality Psychology Compass*, *5*(6), 359–371.

Russell, M., Bebell, D., O'Dwyer, L., & O'Connor, K. (2003). Examining teacher technology use: Implications for preservice and inservice teacher preparation. *Journal of Teacher Education, 54(5)*, 297–310.

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

Saadé, R. G., Nebebe, F., & Tan, W. (2007). Viability of the'Technology Acceptance Model' in Multimedia Learning Environments: A Comparative Study. *Interdisciplinary Journal of Knowledge and Learning Objects*, *3*(2), 175–184.

Saadé, R., & Bahli, B. (2005). The impact of cognitive absorption on perceived usefulness and perceived ease of use in on-line learning: An extension of the technology acceptance model. *Information & Management*, *42*(2), 317–327.

Saba, T. (2012). Implications of E-learning systems and self-efficiency on students outcomes: A model approach. *Human-Centric Computing and Information Sciences*, *2*(1), 1–11.

Sad, S. N., & Ozhan, U. (2012). Honeymoon with IWBs: a qualitative insight in primary students' views on instruction with interactive whiteboard. *Computers & Education*, *59*(4), 1184–1191.

Sahin, I. (2011). Development of survey of technological pedagogical and content knowledge (TPACK). *TOJET: The Turkish Online Journal of Educational Technology*, *10*(1), 97-105.

Salam, S., Mohamad, S. N. M., Bakar, N., & Sui, L. K. M. (2014). The Designing of Online Multiple Intelligence Tools for Lecturers at Polytechnic. *The International Journal of Soft Computing and Software Engineering*, *3*(3), 1-7.

Salem, S. F., & Salem, S. O. (2015). Factors influencing the Learning Management System (LMS) success among undergraduate students in Limkokwing University of Creative Technology, Malaysia. *International Journal of Multicultural and Multireligious Understanding*, *2*(3), 17–26.

Salleh, S. M., & Laxman, K. (2014). Investigating the factors influencing teachers' use of ICT in teaching in Bruneian secondary schools. *Education and Information Technologies*, *19*(4), 747–762.

Sallum, S. A. (2008). Learning Management System implementation: Building strategic change. *Distance Learning*, *5*(1), 68-71.

Sam, T. L. (2015). E-Learning benchmarking survey: A case study of University Utara Malaysia. *Universal Journal of Educational Research*, *3*(4), 269-276.

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.

Sang, S. Lee, J and Lee, J. (2010). E-Government Adoption in Cambodia: A Partial Least Squares Approach: Transforming Government. *People, Process and Policy*, *4* (2), 138 - 157.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2014). PLS-SEM: Looking back and moving forward. *Long Range Planning*, *47*(3), 132–137.

Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online*, *8*(2), 23–74.

Schofield, J. W. (1975). Effect of norms, public disclosure, and need for approval on volunteering behaviour consistent with attitudes. *Journal of Personality and Social Psychology*, *31*(6), 1126–1133.

Schrock, K. (2014). *Infographics as a creative assessment.* Retrieve September 29, 2014, from http://www.schrockguide.net/infographics-as-an-assessment.html

Schumacher, R.E., & Lomax, R.G. (2010). *A beginner's guide to structural equation modelling (3rd Edition)*. NY: Routledge.

Scott, M., & DeSanctis, P. G. (1992). Microlevel structuration in computer-supported group decision making. *Human Communication Research*, *19*(1), 5–49.

Seddon, P. B. (1997). A respecification and extension of the DeLone and McLean model of IS success. *Information Systems Research*, *8*(3), 240–253.

Sekaran, U. & Bougie, R. (2010). *Research methods for business: A skill building approach* (5th ed.). Chichester: John Willey & Sons Ltd.

Sekaran, U., & Bougie, R. (2003). *Research methodology for business.* New York, NY: John Wiley & Sons, Inc.

Selvansubramaniam, S. T., & Krishnan, M. (2013). E-Content development in engineering courses: Students needs and readiness. *International Journal of Business and Social Science*, *4*(6). 282-288.

Selwyn, N. (2010). Looking beyond learning: Notes towards the critical study of educational technology. *Journal of Computer Assisted Learning*, *26*(1), 65–73.

Shaharuddin, B., & Abiddin, N. Z. (2009). Reviewing the Implementation of the Smart Schools and the Training of Bestari Teachers in Malaysia. *Journal of International Social Research*, 2(6), 567-574.

Sharpe, R., Benfield, G., & Francis, R. (2006). Implementing a university e-learning strategy: levers for change within academic schools. *Research in Learning Technology*, *14*(2), 135-151.

Shin, Y. M., Lee, S. C., Shin, B., & Lee, H. G. (2010). Examining influencing factors of post-adoption usage of mobile internet: focus on the user perception of supplier-side attributes. *Information Systems Frontiers*, *12*(5), 595–606.

Shook, C. L., Ketchen, D. J., Hult, G. T. M., & Kacmar, K. M. (2004). An assessment of the use of structural equation modeling in strategic management research. *Strategic Management Journal*, *25*(4), 397-404.

Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods*, *7*(4), 422–445.

Shuai, J.J. (2016). Determinants of Online Religious Service Acceptance: An Empirical Investigation. *International Journal of E-Education, E-Business, E-Management and E-Learning*, *6*(1), 21–26.

Simonetti, B., Sarnacchiaro, P., & Rodríguez, M. R. G. (2016). Goodness of fit measures for logistic regression model: an application for students' evaluations of university teaching. *Quality & Quantity*, *50*(6),1–10.

Šimonová, I. (2016). Mobile Technologies for Foreign Language Learning. *International Journal on Language, Literature and Culture in Education*, *3*(1), 25–39.

Sinclaire, J. K., & Vogus, C. E. (2011). Adoption of social networking sites: An exploratory adaptive structuration perspective for global organizations. *Information Technology and Management*, *12*(4), 293–314.

Singh, V., & Sharma, S. K. (2015). Fuel consumption optimization in air transport: A review, classification, critique, simple meta-analysis, and future research implications. *European Transport Research Review*, *7*(2), 1–24.

Singh, V., & Sharma, S. K. (2016). Analyzing the moderating effects of respondent type and experience on the fuel efficiency improvement in air transport using structural equation modeling. *European Transport Research Review*, *8*(2), 1–20.

Siti, A. H., & Ruziah, G. (2012). *Quick Tips Fast Track Conducting Qualitative Research.* Selangor, Malaysia: Quty Researcher.

Slavin, R. E., Madden, N. A., Dolan, L. J., Wasik, B. A., Ross, S., Smith, L., & Dianda, M. (1996). Success for All: A summary of research. *Journal of Education for Students Placed at Risk*, *1*(1), 41–76.

Sloan, R. H. (2012). Using an eTextbook and iPad: Results of a Pilot Program. *Journal of Educational Technology Systems*, *41*(1), 87–104.

Smith, S. D., & Caruso, J. B. (2010). *Key Findings The ECAR Study of Undergraduate Students and Information Technology*. Retrieved October 6 2016 from http://connect.educause.edu/Library/ECAR/TheECARStudyofUndergradua/47490

So, H.J., & Brush, T. A. (2008). Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: Relationships and critical factors. *Computers & Education*, *51*(1), 318–336.

Srite, M. & Karahanna, E., (2006). The role of espoused national cultural values in technology acceptance. *MIS Quarterly*, *30*(3), 679–704.

Sternberg, R. J., Kaufman, J. C., & Pretz, J. E. (2002). *The creativity conundrum: A propulsion model of kinds of creative contributions*. Psychology Press.

Stewart, C., Bachman, C., & Johnson, R. (2010). Predictors of faculty acceptance of online education. *Journal of Online Learning and Teaching*, *6*(3), 597-616.

Strayer, J. F. (2012). How learning in an inverted classroom influences cooperation, innovation and task orientation. *Learning Environments Research*, *15*(2), 171–193.

Students Enrolment and Intake Unit (2016). Department of Student Affairs Malaysian Polytechnic. Jabatan Pendidikan Politeknik, Kementerian Pendidikan Tinggi Malaysia, Putrajaya.

Subramaniam S.T.S, Norazah N., & Murugan K. (2013). E-Content Development in Engineering Courses: Students Needs and Readiness. *International Journal of Business and Social Science*. *4* (6). 282-288.

Subramanian, G. H. (1994). A replication of perceived usefulness and perceived ease of use measurement. *Decision Sciences*, *25*(5-6), 863–874.

Šumak, B., Heričko, M., Pušnik, M., & Polančič, G. (2011). Factors affecting acceptance and use of Moodle: An empirical study based on TAM. *Informatica*, *35*(1), 91–100.

Sun, R. C. F. (2015). Student Misbehavior in Hong Kong: The Predictive Role of Positive Youth Development and School Satisfaction. *Applied Research in Quality of Life*, 1–17.

Susan A. Brown , Alan R. Dennis & Viswanath Venkatesh (2010) Predicting Collaboration Technology Use: Integrating Technology Adoption and Collaboration Research, *Journal of Management Information Systems*, 27(2), 9-54.

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

Tabachnick, B.G. & Fidell, L.S. (2012). *Using Multivariate Statistics. Sixth Edition*. Upper Saddle River, New Jersey: Pearson Education, Inc.

Tai, Y., & Ting, Y.L. (2011). Adoption of mobile technology for language learning: Teacher attitudes and challenges. *The JALT CALL Journal*, *7*(1), 3–18.

Talley, C., & Scherer, S. (2013). The enhanced flipped classroom: Increasing academic performance with student-recorded lectures and practice testing in a "flipped" STEM course. *The Journal of Negro Education*, 82(3), 339–347.

Tan, F. B., & Hunter, M. G. (2002). The repertory grid technique: A method for the study of cognition in information systems. *Mis Quarterly*, 39–57.

Tarcan, E., Varol, E. S., & Toker, B. (2010). A study on the acceptance of information technologies from the perspectives of the academicians in Turkey. *Ege Akademik Bakis*, *10*(3), 791-812.

Tarhini, A., Hone, K., & Liu, X. (2013). Factors affecting students' acceptance of e-learning environments in developing countries: a structural equation modeling approach. *International Journal of Information and Education Technology*, *3*(1), 54.

Tarhini, A., Hone, K., Liu, X., & Tarhini, T. (2016). Examining the moderating effect of individual-level cultural values on users' acceptance of E-learning in developing countries: a structural equation modeling of an extended technology acceptance model. *Interactive Learning Environments*, *25*(3), 306-328.

Tarhini, A., Hone, K., Liu, X., & Tarhini, T. (2017). Examining the moderating effect of individual-level cultural values on users' acceptance of E-learning in developing countries: a structural equation modeling of an extended technology acceptance model. *Interactive Learning Environments*, *25*(3), 306–328.

Tatlock, S., Arbuckle, R., Sanchez, R., Grant, L., Khan, I., Manvelian, G., & Spertus, J. A. (2016). Psychometric Evaluation of a Treatment Acceptance Measure for Use in Patients Receiving Treatment via Subcutaneous Injection. *Value in Health*, *20*(3), 430-440.

Teclehaimanot, B. & Hickman, T. (2010). Student-Teacher Interaction on Facebook: What Teachers Find Appropriate. In J. Herrington & C. Montgomerie (Eds.), *Proceedings of ED-MEDIA 2010--World Conference on Educational Multimedia, Hypermedia & Telecommunications* (pp. 2157-2162). Toronto, Canada: Association for the Advancement of Computing in Education (AACE).

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

Teo, T. (2012). Examining the intention to use technology among pre-service teachers: An integration of the technology acceptance model and theory of planned behavior. *Interactive Learning Environments*, *20*(1), 3–18.

Teo, T. (2014). Unpacking teachers' acceptance of technology: Tests of measurement invariance and latent mean differences. *Computers & Education*, *75*(1), 127–135.

Teo, T. (2015). Comparing pre-service and in-service teachers' acceptance of technology: Assessment of measurement invariance and latent mean differences. *Computers and Education*, *83*(1), 22–31.

Teo, T. S. H., Lim, V. K. G., & Lai, R. Y. C. (1999). Intrinsic and extrinsic motivation in internet usage. *Omega*, *27*(1), 25–37.

Teo, T., & Zhou, M. (2014). Explaining the intention to use technology among university students: A structural equation modeling approach. *Journal of Computing in Higher Education, 26*(2), 124–142.

Teo, T., Milutinović, V., & Zhou, M. (2016). Modelling Serbian pre-service teachers' attitudes towards computer use: A SEM and MIMIC approach. *Computers and Education, 94(1),* 77–88.

Terawaki, Y. (2009). Framework for supporting decision making in learning management system selection. In proceedings of the *Symposium on Human Interface* (pp. 699–707). San Diego, United States of America, July 2009.

Terras, M. M., & Ramsay, J. (2012). The five central psychological challenges facing effective mobile learning. *British Journal of Educational Technology*, *43*(5), 820–832.

Thompson, B. (2002). Statistical, practical, and clinical: How many kinds of significance do counselors need to consider? *Journal of Counseling and Development*, *80*(1), 64–71.

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS Quarterly*, *15*(1), 124–143.

Thurstone, L. L. (1931). *The Theory of Multiple Factors*. Ann Arbor, MI: Edwards Brothers.

Tighe, E. L., & Schatschneider, C. (2015). Exploring the Dimensionality of Morphological Awareness and Its Relations to Vocabulary Knowledge in Adult Basic Education Students. *Reading Research Quarterly*. *50*(3). 293–311.

Tikly, L., B. A. (2010). Social justice, capabilities and the quality of education in low income countries. *Elsevier*, *31*, 3–14. doi:10.1016/j.ijedudev.2010.06.001

Timmis, S. E., & Cook, J. H. (2001). Motivating students towards online learning: Institutional strategies and imperatives. *Proceedings of the New Educational Benefits of ICT in Higher Education*, 71–77.

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

Torrisi Steele, G., & Drew, S. (2013). The literature landscape of blended learning in higher education: the need for better understanding of academic blended practice. *International Journal for Academic Development*, *18*(4), 371-383.

Tosuntas, S. B., Karadag, E., & Orhan, S. (2015). The factors affecting acceptance and use of interactive whiteboard within the scope of FATIH project: A structural equation model based on the Unified Theory of acceptance and use of technology. *Computers & Education. 81*(1), 169–178.

Trochim, W.M.K., & Donnelly, J.P. (2006). Research methods knowledge base. 3rd ed. Mason, OH: Thomson from http://www.socialresearchmethods.net/kb/.

Tsai, M.J. & Tsai, C.C. (2003) Information searching strategies in web-based science learning: The role of Internet self-efficacy, *Innovations in Education and Teaching International*, 40, 43–50.

Tselios, N. K., Daskalakis, S., & Papadopoulou, M. (2011). Assessing the Acceptance of a Blended Learning University Course. *Educational Technology & Society*, *14*(2), 224–235.

Tshabalala, M., Ndeya-Ndereya, C., & Van der Merwe, T. (2014). Implementing blended learning at a developing university: Obstacles in the way. *Electronic Journal of E-Learning*, *12*(1), 101–110.

Tung, F.C. & Chang, S.C., (2008). A new hybrid model for exploring the adoption of online nursing courses. *Nurse Education Today*, *28*(3), 293–300.

Tung, F.C., & Chang, S.C. (2008). Nursing students' behavioral intention to use online courses: A questionnaire survey. *International Journal of Nursing Studies*, *45*(9), 1299-1309.

Tunku Abdul Rahman University College (2014). TAR College. (n.d). *College E-Learning System (CEL).* Retrieve June 3, 2015, from http://elearning4.tarc.edu.my/index.htm

Underwood, J., & Dillon, G. (2011). Chasing dreams and recognising realities: Teachers' responses to ICT. *Technology, Pedagogy and Education*, *20*(3), 317–330.

UNESCO (2003). ICT Policies of Asia and the Pacific. Bangkok: UNESCO. Available online at: http://www.unescobkk.org.

UNESCO (2012). 2012 Paris OER Declaration. World OER Congress, Paris, June 2012. Retrieved from http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/

Universiti Putra Malaysia (2014), Learning Management System. (n.d). *Putra Learning Management System.* Retrieved March 6, 2014, from http://www.lms.upm.edu.my/i3learn/www/about.htm

Universiti Teknologi Malaysia (2014), Learning Management System. (n.d). *E-Learning@UTM.* Retrieved April 10, 2014, from http://elearning.utm.my/13142/

Valk, J.H., Rashid, A. T., & Elder, L. (2010). Using mobile phones to improve educational outcomes: An analysis of evidence from Asia. *The International Review of Research in Open and Distributed Learning*, *11*(1), 117–140.

Van Aswegen, K., Huisman, M., & Taylor, E. (2014). To use or not to use? SDM utilisation in the development of LMS in South Africa. *Interactive Technology and Smart Education*, *11*(4), 238–253.

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.

Vassileva, J. (2009). Towards social learning environments. *IEEE Transactions on Learning Technologies*, *1*(4) 199–214.

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. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision Sciences*, *27*(3), 451–481.

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., Croteau, A.M., & Rabah, J. (2014). Perceptions of effectiveness of instructional uses of technology in higher education in an era of Web 2.0. In *System Sciences (HICSS), 2014 47th Hawaii International Conference on* (pp. 110–119). Waikoloa, HI, USA, 6-9 January 2014.

Venkatesh, V., M.G. and Ackerman, P.L. (2000). A longitudinal field study of gender differences in individual technology adoption decision making processes. *Organizational Behavior Human Decision Processes*, *83*(1), 33-60.

Venkatesh, V., Morris, M. G., & Ackerman, P. L. (2000). A longitudinal field investigation of gender differences in individual technology adoption decision-making processes. *Organizational Behavior and Human Decision Processes*, *83*(1), 33–60.

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

Venkatesh, V., Morris, M.G., Davis, G.B. & Davis, F.D., (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.

Viberg, O., & Grönlund, Å. (2015). Understanding students' learning practices: Challenges for design and integration of mobile technology into distance education. *Learning, Media and Technology*, *1*(1), 1–21.

Vogt, W. P., & Johnson, R. B. (2011). *Dictionary of Statistics & Methodology: A Nontechnical Guide for the Social Sciences: A Nontechnical Guide for the Social Sciences*. (4th Ed.). California, USA: Sage.

Wahab, S. H. A., Zakaria, M. A., & Jasmi, M. A. (2010). Transformational of Malaysian's polytechnic into university college in 2015: Issues and challenges for malaysian technical and vocational education. In *Proceedings of the 1st UPI International Conference on Technical and Vocational Education and Training* (pp. 570–578).

Wall, J.& Ahmed, V. (2008). Use of a simulation game in delivering blended lifelong learning in the construction industry – Opportunities and Challenges. *Computers & Education, 50*(4), 1383-1393.

Wan, Z., Fang, Y., & Neufeld, D. J. (2007). The role of information technology in technology-mediated learning: A review of the past for the future. *Journal of Information Systems Education, 18*(2), 183-192.

Wang, H. C., & Chiu, Y. F. (2011). Assessing e-learning 2.0 system success. *Computers & Education*, *57*(2), 1790–1800.

Wang, J., & Wang, X. (2012). *Structural Equation Modeling: Application using Mplus.* West Sussex: Wiley.

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

Wang, Y. S., Wu, M. C., & Wang, H. Y. (2009). Investigating the determinants and age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology*, *40*(1), 92-118.

Wang, Y.M., Wang, Y.S., & Yang, Y.F. (2010). Understanding the determinants of RFID adoption in the manufacturing industry. *Technological Forecasting and Social Change*, *77*(5), 803–815.

Wang, Y.S., & Wang, H.Y. (2008). Developing and validating an instrument for measuring mobile computing self-efficacy. *Cyberpsychology & Behavior : The Impact of the Internet, Multimedia and Virtual Reality on Behavior and Society*, *11*(4), 405–413.

Ward, L.& Parr, J. M. (2010). Revisiting and reframing use: Implications for the integration of ICT. *Computers & Education, 54*(1), 113-122.

Weaver, D., Spratt, C., & Nair, C. (2008). Academic and student use of a LMS: Implications for quality. *Australasian Journal of Educational Technology, 24*(1), 30-41.

Webb, M. (2014). Pedagogy with information and communications technologies in transition. *Education and Information Technologies*, *19*(2), 275–294.

Webb, M., & Gibson, D. (2015). Technology enhanced assessment in complex collaborative settings. *Education and Information Technologies*, *20*(4), 675–695.

Webster, J., & Hackley, P. (1997). Teaching effectiveness in technology-mediated distance learning. *Academy of Management Journal*, *40*(6), 1282–1309.

Weissberger, A.J. (2010). Exponential Growth. *M2M Market Dependent on Important Network Enhancements.* Retrieved from http://viodi.com/2010/10/07/exponential-growth-in-m2m-market-dependent-on-important-network-enhancements/

Welsh, E. T., Wanberg, C. R., Brown, K. G., & Simmering, M. J. (2003). E-learning: emerging uses, empirical results and future directions. *International Journal of Training and Development*, *7*(4), 245–258.

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.

West, S. G., Taylor, A. B., & Wu, W. (2012). Model fit and model selection in structural equation modeling. *Handbook of Structural Equation Modeling*, 209–231.

Wheaton, B., Muthen, B., Alwin, D. F., & Summers, G. F. (1977). Assessing reliability and stability in panel models. *Sociological Methodology*, *8*(1), 84–136.

Wheeler, B. (2004). Open Source 2007: How Did This Happen? *EDUCAUSE Review*, 12–27.

Williams, J., & Chinn, S. J. (2009). Using Web 2.0 to support the active learning experience. *Journal of Information Systems Education*, *20*(2), 165-174.

Wong, S. L., Ibrahim, N., & Mohd Ayub, A. F. (2012). Learning strategies as correlates of computer attitudes: a case study among Malaysian secondary school students. *International Journal of Social Science and Humanity*, *2*(2), 123–126.

Woods, R., Baker, J. D., & Hopper, D. (2004). Hybrid structures: Faculty use and perception of web-based courseware as a supplement to face-to-face instruction. *The Internet and Higher Education*, *7*(4), 281–297.

Wook, M., Yusof, Z. M., & Nazri, M. Z. A. (2014). Data mining technology adoption in institutions of higher learning: A conceptual framework

incorporating technology readiness index model and technology acceptance model 3. *Journal of Applied Sciences, 14*(18), 2129-2138.

Woolgar, S. (2002). Virtual society? Technology, Cyberbole, Reality (Oxford: Oxford University Press).

Wu, A. D., & Zumbo, B. D. (2008). Understanding and using mediators and moderators. *Social Indicators Research*. *87*(3). 367-392.

Wu, C. H., Kao, S. C., & Shih, L. H. (2010). Assessing the suitability of process and information technology in supporting tacit knowledge transfer. *Behavior and Information Technology*, 29(5), 513–525.

Wu, C., & Liu, C.F. (2013). Acceptance of ICT-mediated teaching/learning systems for elementary school teachers: Moderating effect of cognitive styles. *Education and Information Technologies*, *20*(2), 381–401.

Wu, J.H., & Wang, S.C. (2005). What drives mobile commerce?: An empirical evaluation of the revised technology acceptance model. *Information & Management*, *42*(5), 719–729.

Wu, J.H., Wang, S.C., & Lin, L.M. (2007). Mobile computing acceptance factors in the healthcare industry: A structural equation model. *International Journal of Medical Informatics*, *76*(1), 66–77.

Wu, M. L. (2009). *Structural Equation Modeling: Operation and application of AMOS*. Taipei, Taiwan: Nan Book Inc.

Wu, W. H., Wu, Y. C. J., Chen, C. Y., Kao, H. Y., Lin, C. H., & Huang, S. H. (2012). Review of trends from mobile learning studies: A meta-analysis. *Computers & Education*, *59*(2), 817-827.

Yan, W., Yan, W., Deng, S., Deng, S., Zhang, Y., & Zhang, Y. (2016). Factors influencing the intention to use information service mashups: An empirical study of digital libraries in China. *The Electronic Library*, *34*(4), 696–716.

Yeatts, P. E., Barton, M., Henson, R. K., & Martin, S. B. (2017). The Use of Structure Coefficients to Address Multicollinearity in Sport and Exercise Science. *Measurement in Physical Education and Exercise Science*. 21(2). 83–91.

Yen, J.C., & Lee, C.Y. (2011). Exploring problem solving patterns and their impact on learning achievement in a blended learning environment. *Computers & Education*, *56*(1), 138–145.

Yi, M. Y., & Hwang, Y. (2003). Predicting the use of web-based information systems: self-efficacy, enjoyment, learning goal orientation, and the technology acceptance model. *Int. J. Human-Computer Studies*, *59*(4), 431–449.

Yoo, S. J., Han, S., & Huang, W. (2012). The roles of intrinsic motivators and extrinsic motivators in promoting e-learning in the workplace: A case from South Korea. *Computers in Human Behavior*, *28*(3), 942–950.

Yoon, C., & Kim, S. (2007). Convenience and TAM in a ubiquitous computing environment: The case of wireless LAN. *Electronic Commerce Research and Applications*, *6*(1), 102–112.

Yunus, M. M., & Suliman, A. (2014). Information & Communication Technology (ICT) tools in teaching and learning literature component in Malaysian secondary schools. *Asian Social Science*, *10*(7), 136–152.

Zahari, Z. B. (2012). *Evaluation of Learning Management System–Curriculum Information Document On-Line System (CIDOS) application in Polytechnics.* Unpublished doctoral dissertation, Universiti Utara Malaysia.

Zaharias, P., & Pappas, C. (2016). Quality Management of Learning Management Systems: A User Experience Perspective. *Current Issues in Emerging eLearning*, *3*(1), 60-83.

Zaihasrina, Z. (2012). *Evaluation of Learning Management System-Curriculum Information Document On-Line System (CIDOS) Application in Polytechnics.* Unpublished master's thesis, Universiti Utara Malaysia, Malaysia.

Zainal Abidin, Z.A. (2014). *Garis Panduan Amalan Terbaik Konsep Pembelajaran Teradun bagi Politeknik-Politeknik Malaysia. Kementerian Pendidikan Malaysia*. Jabatan Pengajian Politeknik. Bahagian Instruksional dan Pembelajaran Digital. Center of eLearning and Teaching (CeLT).1-63.

Zha, X., Li, L., Yan, Y., Wang, Q., & Wang, G. (2016). Exploring digital library usage for getting information from the ELM perspective: The moderating effect of information need. *Aslib Journal of Information Management*. *68*(3), 286–305.

Zhang, J., & Duan, Y.(2010). Empirical study on the impact of market orientation and innovation orientation on new product performance of Chinese manufacturers. *Nankai Business Review International*, *1*(2), 214-231.

Zhao, X., Lynch, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, *37*(2), 197–206.

LIST OF PUBLICATIONS

A. Book Chapter

1. Borderless Open Access Education

Ismail, N., Mohd Ayub, A.F., Md Yunus, A.S., & Ab. Jalil, H., (2016). Harmonisation of blended learning design in true practice and allocated courses via CIDOS LMS to nurture teaching and learning engagement. In A. Ideris, R. Varatharajoo, F. Romli, A. Bakar, A. Arokiasamy, (Eds), *Borderless Open Access Education.* (pp. 370-382). Selangor, Malaysia: Universiti Putra Malaysia Press.

2. Computer Application for Polytechnic Syllabus

Ismail, N., (2012). Presentation and basic of Multimedia. In N. Ismail, A. Marsithi, U. Mokhtar, Z. Rosli, & N. Zainal Apandi, (Eds.), *Computer Application for Polytechnic Syllabus (Second Edition)* (pp. 207-262). Melaka, Malaysia: Politeknik Merlimau.

B. Journal Papers

1. Malaysian Journal of Distance Education (MJDE)

Ismail, N., Wan Ali, W. Z., Md Yunus, A.S., & Mohd Ayub, A.F. (2014). The effects of blended learning methods on educational achievement and the development of online material in a Curriculum Information Document Online System (CIDOS) for computer application courses. *Malaysian Journal of Distance Education, 16*(2), 59–82.

2. International Journal of Education and Training (InjET)

Ismail, N., Wan Ali, W. Z., Md Yunus, A.S., & Mohd Ayub, A.F. (2016). Harmonization of active learning: A driver of nurturing engineering learner's motivation? *International Journal of Education and Training* (InjET) (Special Issue), December: 1-15.

3. Advanced Science Letters

Ismail, N., Mohd Ayub, A.F., Md Yunus, A.S., & Ab. Jalil, H. (2017). Utilising CIDOS LMS in technical higher education: The influence of compatibility roles on consistency of use. *Advanced Science Letters, American Scientific Publishers, 23*(8), 7783–7787.

4. Journal of Technical Education and Training (Under progress)

Ismail, N., Mohd Ayub, A.F., & Sarji, N. (2017). Emblematic practice of CIDOS LMS: A Say-so or mythos? *Journal of Technical Education and Training (JTET).*

C. Conference Presentation

1. Social Science Post Graduate International Seminar (SSPIS)

Ismail, N., Wan Ali, W. Z., Md Yunus, A.S., Mohd Ayub, A.F. (2014). Effect of blended method on learning achievement and development of online material in Curriculum Information Document Online System (CIDOS) for computer application course. In *proceedings of the Social Sciences Postgraduate International Seminar* (pp. 336-353). Pusat Pengajian Sains Kemasyarakatan. Universiti Sains Malaysia, Pulau Pinang, Malaysia, 21 October 2014.

2. 4th World Congress on Technical Vocational Education Training (TVET)

Ismail, N., & Ali, W. (2014). The impact of computer literacy skill via Learning Management System (LMS) on an effective learning practice. In *proceedings of the 4th World Congress on TVET* (pp. 404-417). Advanced Centre for Technical and Vocational Education *(*ACTiVE). Universiti Tun Hussein Onn Malaysia. Melaka, Malaysia, 5-6 November 2014.

3. Graduate Research in Education Conference (GREduc)

Ismail, N., Wan Ali., W.Z., Md Yunus, A.S., & Mohd Ayub, A. F. (2014). The impact of problem based learning in Numerical Methods on learners' academic performance. In *proceedings of the Graduate Research in Education Conference (GREduc)* (pp. 604–618). Faculty of Educational Studies. Universiti Putra Malaysia, 21 December 2014.

4. 3rd International Conference on Educational Research and Practice (ICERP)

Ismail, N., Wan Ali, W. Z., Md Yunus, A.S., & Mohd Ayub, A.F. (2015). Active learning approach for Engineering Mathematics 3 course to encourage student's motivation. In *proceedins of the 3rd International Conference on Educational Research and Practice (ICERP)* (pp.107-121). Putrajaya, Malaysia, 25-26 August 2015.

5. The Association of Southeast Asian Institutions of Higher Learning (ASAIHL)

Ismail, N., Mohd Ayub, A.F., Md Yunus, A.S., & Ab. Jalil, H. (2016). Harmonisation of blended learning design in true practice and allocated courses via CIDOS LMS to nurture teaching and learning engagement. In *proceedings of the ASAIHL Conference*. (pp. 43-48). Putrajaya, Malaysia, 4-6 December 2016.

6. International Conference of Business and Social Science (ICOBSS)

Ismail, N., Mohd Ayub, A.F., Md Yunus, A.S., & Ab. Jalil, H. (2017). Utilising CIDOS LMS in technical higher education: The influence of compatibility roles on consistency of use, In *proceedings of the International Conference of Business and Social Science (ICOBSS)*. (pp.22-30). Melaka, Malaysia, 28 February – 1 March 2017.

D. E-Learning Competition

1. Category: Learning Management System (Silver medal)

Ismail, N., Mohd Ayub, A.F., & Sarji, N. (2017). Emblematic practice of CIDOS LMS: A Say-so or mythos? In *E-Learning Competition and Carnival (ELC 2017), LMS Category.* Booth No. 32. Resource Centre and Teaching Technology, Universiti Teknikal Malaysia, Melaka, 27 July 2017.

2. Category: Teaching and Learning Material (Bronze medal)

Ismail, N., Mohd Ayub, A.F., Md Yunus, A.S., & Abd. Jalil, H. (2017). CIDOS LMS adoption: A multi-stage cluster analysis. In *Hari Inovasi (HInovasi 2017), LMS Category.* Booth No. 104. Faculty of Education, Universiti Kebangsaan Malaysia, Bangi, 11 July 2017.

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