FACTORS INFLUENCING PERCEIVED SELF-PACED LEARNING: MAXIMIZING ICT USE AMONG UTAR UNDERGRADUATE STUDENTS

TAN JIAN HENG

MASTER OF PHILOSOPHY

(SOCIAL SCIENCES)

FACULTY OF ARTS AND SOCIAL SCIENCE

UNIVERSITI TUNKU ABDUL RAHMAN

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FACTORS INFLUENCING PERCEIVED SELF-PACED LEARNING:
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By

TAN JIAN HENG

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ABSTRACT

**FACTORS INFLUENCING PERCEIVED SELF-PACED LEARNING:
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Tan Jian Heng

The ultimate goal of this study is to acquire the best-fit model to explain the utilization factors that maximise undergraduates' use of ICT for self-paced learning. The questionnaire was constructed based on the Technology Acceptance Model theory and three additional exogenous variables, which are mastery, motivation, and subjective norm. The research was carried out using quantitative method and the survey forms were distributed to the UTAR undergraduates located in Peninsular Malaysia. A pilot test was done among 60 undergraduate students and the reported Cronbach alpha coefficient value ranged from .763 and .869. A total of 853 valid data was successfully screened using SPSS and the items of the constructs underwent the Confirmatory Factor Analysis procedure and Structural Equation Modeling using AMOS.

The finalised model of this study predicts the factors that maximise the use of ICT among undergraduates for their self-paced learning. Out of the eleven hypotheses paths formulated for this study, nine hypothesis were proven valid. The findings indicated that mastery had an influence on perceived ease of use whereas motivation had influence on perceived usefulness. Attitude towards using ICT, perceived usefulness, and subjective norm was found to have influenced behavioural intention of undergraduate students to maximise their ICT use for self-paced learning. Additional to these findings, perceived ease of use and perceived usefulness influenced students' attitude towards using ICT and perceived ease

of use was found to have influenced perceived usefulness. Behavioural intention to use ICT was also found to have significant influence over the actual use of ICT for self-paced learning among the undergraduate students. On the other hand, two paths were found to be insignificant in this study which were mastery to perceived usefulness and subjective norm to perceived usefulness. In addition, one new path emerged from the analysis. The new emerged path is mastery linking to motivation ($\beta = 0.361$, $p < 0.001$). More than half of the variance in the model explained the students' behavioural intention to use ICT (53.9%) for their self-paced learning.

The findings from this study confirms that the three traditional variables are the major contributor to the model, which are perceived ease of use, perceived usefulness, and attitude towards using ICT. The factors in TAM and additional three factors have contributed directly and indirectly in the model to explain the maximum use of ICT for self-paced learning among undergraduate students. Hence, the factors investigated in this study were significant and have an influencing element in exploiting the causal process in the model of self-paced learning. As a conclusion, by knowing the students' perspective when it comes to ICT usage for self-paced learning, this study offers theoretical and practical insights on how students were triggered to use ICT in their self-paced learning environment.

Specially dedicated to

My life pillar and beloved mother; Selvarani Simyon,

My Cheeky Sister; Tan Pei Feng,

My Supportive Sister; Tan Pei Yin

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This dissertation entitled "**FACTORS INFLUENCING PERCEIVED SELF-PACED LEARNING: MAXIMIZING ICT USE AMONG UTAR UNDERGRADUATE STUDENTS**" was prepared by TAN JIAN HENG and submitted as partial fulfilment of the requirements for the degree of Master of Philosophy in Social Science at Universiti Tunku Abdul Rahman.

Approved by:

_____

(Assistant Professor Dr. PRISCILLA MOSES)
Date:…………………..
Supervisor
Department of General Studies
Faculty of Creative Industries
Universiti Tunku Abdul Rahman

_____

(Assistant Professor Dr. CHEAH PHAIK KIN)
Date:…………………..
Co-supervisor
Department of Public Relations
Faculty of Arts and Social Science
Universiti Tunku Abdul Rahman

FACULTY OF ARTS AND SOCIAL SCIENCE

UNIVERSITI TUNKU ABDUL RAHMAN

Date: _____

SUBMISSION OF DISSERTATION

It is hereby certified that **Tan Jian Heng** (ID No: **16AAM06164**) has completed this dissertation entitled " (FACTORS INFLUENCING PERCEIVED SELF-PACED LEARNING: MAXIMIZING ICT USE AMONG UTAR UNDERGRADUATE STUDENTS) " under the supervision of Assistant Professor Dr. Priscilla Moses (Supervisor) from the Department of General Studies, Faculty of Creative Industries, and Assistant Professor Dr. Cheah Phaik Kin (Co-Supervisor) from the Department of Public Relations, Faculty of Arts and Social Science.

I understand that the University will upload softcopy of my dissertation in pdf format into UTAR Institutional Repository, which may be made accessible to UTAR community and public.

Yours truly,

_____

(Tan Jian Heng)

DECLARATION

I, Tan Jian Heng hereby declare that the dissertation is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institutions.

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(TAN JIAN HENG)

Date……………….

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LIST OF ABBREVIATIONS

A	Attitude towards Using ICT
AMOS	Analysis of Moment Structures
AVE	Average Variance Extracted
BI	Behavioural Intention to Use
β	Beta
C.R.	Construct Reliability
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CR	Composite Reliability
D^2	Mahalanobis squared distance
df	Degree of Freedom
ETP	Economic Transformation Programme
GDP	Gross Domestic Product
GFI	Goodness-of-fit Index
GTP	Government Transformation Programme
HEIs	Higher Education Institutions
HICoE	Higher Institutions Centers of Excellence
IBM SPSS	International Business Machines Statistical Package for the Social Science
ICT	Information and Communication Technologies
IU	Actual ICT Use
M	Mean
Mo	Motivation
MOE	Ministry of Education
Ms	Mastery
NKRAs	National Key Result Area
OECD	The Organisation for Economic Co-operation and Development

P	Level of Significant
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
R²	Squared Multiple Correction
RMSEA	Root Mean Square Error of Approximation
S.D.	Standard Deviation
S.E.	Standard Error of regression weight
SEM	Structural Equation Modeling
SN	Subjective Norm
SPSS	Statistical Package for the Social Science
SSQS	Smart School Qualification Standards
TAM	Technology Acceptance Model
TRA	Theory of Reasoned Action
TLI	Tucker-Lewis Index
TOL	Detection-tolerance
UTAR	Universiti Tunku Abdul Rahman
VIF	Variance Inflation Factor
WWW	World Wide Web
χ^2	Chi-Square statistic

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

In this age of globalization, Information and Communication Technologies (ICT) have become a powerful and influential tool for education as it is capable of creating a channel for educational reformation and to further develop holistic potential of an individual, so as to create a balanced individual in terms of physically and mentally (Gan, 2001; Chan, 2002; Koo, 2008; Majumdar, 2015).

Moreover with the support of the growing internet availability, increase in mobile technologies, and the high acceptance of electronic learning (e-learning), ICT have provided a basis for the growth of learning independency and create a context in which it can co-exist and develop educational opportunities (Massey, Ramesh, & Khatri, 2006). With that ICT advancement, the learning processes surpass the physical space and making it more individualized and lifelong for those who utilize it.

Malaysian education system has gone through much metamorphosis and continues to do so as more researches are being done to improve and advance the existing educational approach to suit the current technological embedded period. The current educational system evolved from traditional, to embracing modernity in its content and approach (Othman & Mohamad, 2011). As learning processes surpass the four walls of a classroom and modernity is slowly taking over in tertiary education institutions, the Ministry of Education have aimed to maximize the usage of ICT for self-paced learning (Ministry of Education, 2015) as one of the effort to achieve Vision 2020 and to accelerate the education system. In the Malaysia Education Blueprint 2015-2025, the Ministry of Education and

Ministry of Higher Education have thoroughly highlighted the challenges, initiatives and importance of technology integration in education in order to accelerate Malaysian education system through creative use of ICT (Ministry of Education, 2015).

The Malaysian government has promoted education as the main agenda of the nation since independence by then Prime Minister; Tunku Abdul Rahman till the current Prime Minister; Tun Dr. Mahathir bin Mohamad. Former Prime Minister Dato' Sri Haji Mohammad Najib has repeatedly emphasized that investment in education and training is precursor for the wealth of the country and the welfare of the people (Ministry of Education, 2015). A new National Education Blueprint was developed after a full review of the Malaysian education system which part of the review suggested for the maximizing ICT usage for self-paced learning by the students to enhance learning better (Ministry of Education, 2015). The decision was made by the government in the context of the raising international education principles as well. The raising international education principles left Malaysian with no choice but pushed Malaysian government to desire for a better preparation of Malaysia's youngsters for 21st century, and amplified public and parental anticipations of the education policies (Ministry of Education, 2015). Thus, to ensure a higher education system that modern society demands for their younger generation to produce students who are reliable and acquire 21st century literary skills, ICT proficiency in higher education must be given importance and emphasized.

Classroom context alone cannot satisfy student's learning needs as it differs from one another. Students are given the opportunity to study on their own pace with the help of ICT and not left out when some students cannot cope with a lesson due to the classroom pace. Classroom study pace is not ideal for all learners and through the usage of ICT for self-paced learning, there is a hope for learners to finish studying in their own pace without

being constantly pressured to finish a lesson or assignments within the time frame. Moreover, the university students can also have a frequent interaction between their lecturers and tutors as internet offers the opportunity for the students to communicate outside of the classroom using ICT tools such as laptop, mobile phones and tablets (Soleimani, Ismail, & Mustaffa, 2014).

Wilson, Tete-Mensah and Boeteng (2014) regarded the implementation of self-paced learning through ICT usage can be achieved and students will be able to have access to higher learning experiences as they are not limited to gain knowledge through this method of learning. Teo et al. (2010) also viewed that through self-paced learning, a student will acquire higher order thinking and complex problem solving skills, which is needed and essential in tertiary education context. Besides this, Oye, Iahad, and Abdul Rahim (2012) argued that knowledge and ICT usage also improves human capacity in all aspects of life in general. These are facts that are in line with the government's aim for the implementation of self-paced learning using ICT among undergraduates in tertiary education institutions.

Since this study is in line with the government's aim, investigating the factors that influence undergraduates' self-paced learning using ICT is essential. This will enable the education institutions, policy makers, and educators to have a reference channel to maximize the students' learning by encouraging further use of ICT.

1.2 Statement of the Problem

In current years, the use of ICT has become essential within the Higher Education Institutions (HEIs) and online academic courses are mushrooming and it is a flourishing phenomenon. Numerous HEIs integrated ICT tools in their learning systems as the medium of instruction and learning. Given the significant implication of ICT in learning processes,

the use of ICT for self-paced learning among students needs to be studied. ICT has the ability to foster a virtual contact between instructor and student although the student is physically away from the classroom. ICT kept the students updated and enhanced educator's capacity to stay connected through e-mail, e-learning platforms, internet, WBLE, and social media platforms (Soleimani, Ismail, & Mustaffa, 2014).

Moreover, with the current government's encouragement, universities have always tried hard to develop and integrate ICT usage in the curriculum and as well as encourage undergraduates to use ICT tools such as Internet, computers, laptops, and E-learning tools in their learning processes regardless of the time as it is considered necessary. Thus, the use of ICT apparatuses in universities has captured many researchers' attention to investigate the topics that are related with ICT use such as e-learning (Khrisat, & Mahmoud, 2013; Rasouli, Rahbania, & Attaran, 2016; Almpanis, 2016; Cação, 2017), mobile learning (Parajuli, 2016; Mugo,Njagi, Chemwei, & Motanya, 2017), smartphone usage (Ramamuruthy, & Rao, 2015; Buchholz, Perry, Weiss, & Cooley, 2016; Lekawael, 2017), internet usage (Meti, 2014; Kute, & Palsamkar. 2017; Norliah et at., 2017), and web application usage (Keng, & Ching, 2015; Pechenkina, 2017) in education among educators and especially undergraduates.

Apart from the attention given by the researchers on the transformative potential of ICT in education, it was also well recognized by Malaysian government. Among the first few countries in the world, Malaysia established tactical ICT plan for its education system as reviewed by UNESCO (Abdul Razak, Abu Bakar, Abdullah, & Abdullah, 2016) and have some remarkable range of policies and plans developed to use ICT in education. To make the plans and policies to work and implemented, the Ministry has spent around RM6 billion on ICT in education initiatives (Ministry of Education, 2012). In the year 2010, a

study carried out by the ministry showed that ICT usage among students was relatively inadequate despite the large expenditure of funds invested on ICT in education initiatives in primary, secondary, and tertiary education level (Ministry of Education, 2012). This have lead the ministry to promote and aim for maximizing the utilization of ICT for self-paced learning among the students.

In relation with this issue, the researcher discovered that there were a few related past studies and researches (Bonk, 2002; Hu, 2008; Sharma, Sharma, & Seema, 2011; Edgar, 2018; Alhquish, 2014; Wilson, Tete-Mensah, & Boeteng, 2014; Wilson, 2014; Hon & Ho, 2015; Masa'deh, Tarhini, Mohammed, & Maqableh, 2016) carried out that suggested several factors have influenced the undergraduates in using ICT for self-paced learning. However, most studies focused on undergraduate's perception and acceptance of future integration of technology into learning and far too little attention is given towards studying undergraduates for their actual utilization of ICT in Malaysian HEIs for their self-paced learning. Secondly, even if there are numerous past studies carried out using TAM model, there is still a lack of literature about undergraduates' ICT use for self-paced learning in Malaysian context through the established model.

Thus, for aforementioned reasons, there is a need for a research to be done in Malaysia to investigate the factors that can maximize the current usage of ICT for self-paced learning among undergraduates and identify factors that influence undergraduates to use ICT.

1.3 Objective of the Study

In this study, the sole objective will be achieved by extending the Technology Acceptance Model and investigate additional variables which includes perceived ease of use, perceived usefulness, attitude, behavioral intention to use ICT, actual ICT use, mastery, motivation,

and subjective norm. Thus, the objective to be achieved in this present study is by extending the Technology Acceptance Model (TAM) to predict factors that maximize the use of ICT for self-paced learning among UTAR undergraduate students.

1.4 Research Questions

The subsequent research questions were framed based on the objective and literature review:

RQ1: Does Mastery has significant influence on Perceived Usefulness?

RQ2: Does Mastery has significant influence on Perceived Ease of Use?

RQ3: Does Motivation has significant influence on Perceived Usefulness?

RQ4: Does Subjective Norm has significant influence on Perceived Usefulness?

RQ5:   Does Subjective Norm has significant influence on Behavioral Intention to Use ICT?

RQ6: Does Perceived Ease of Use has significant influence on Perceived Usefulness?

RQ7: Does Perceived Ease of Use has significant influence on Attitude towards Using ICT?

RQ8: Does Perceived Usefulness has significant influence on Attitude towards Using ICT?

RQ9: Does Perceived Usefulness has significant influence on Behavioral Intention to Use ICT?

RQ10: Does Attitude toward Using has significant influence on Behavioral Intention to Use ICT?

RQ11: Does Behavioral Intention to Use ICT has significant influence on Actual ICT Use

     for Self-paced Learning?

1.5 Hypotheses of the Study

This section consist of developed hypotheses for this current study that were formulated

from the review of literature. The hypotheses are as follows:

H1: Mastery has a significant influence on Perceived Usefulness.

H2: Mastery has a significant influence on Perceived Ease of Use.

H3: Motivation has a significant influence on Perceived Usefulness.

H4: Subjective Norm has a significant influence on Perceived Usefulness.

H5: Subjective Norm has a significant influence on Behavioral Intention to Use ICT.

H6: Perceived Ease of Use has a significant influence on Perceived Usefulness.

H7: Perceived Ease of Use has a significant influence on Attitude towards Using ICT.

H8: Perceived Usefulness has a significant influence on Attitude towards Using ICT.

H9: Perceived Usefulness has a significant influence on Behavioral Intention to Use ICT.

H10: Attitude toward Using has s significant influence on Behavioral Intention to Use ICT.

H11: Behavioral Intention to Use ICT has a significant influence on Actual ICT Use for

     Self-paced Learning.

1.6 Significance of the Study

The ever-increasing availability of ICTs in this modern era has resulted in an increased use

of ICT devices for personal learning outside of classroom in higher education institutions

by the students. Apart from that, ICT also can assist student's self-paced learning in which it allows the students to become a more independent learner who are responsible for their own learning process and enabling them to cultivate higher order thinking skills which is important in the job field in this 21st century (Ministry of Education, 2015).

As such with the proliferation of ICT use among higher education establishment students, lecturers need to ensure that the students are using ICT tools to the maximum level when it comes to learning. Moreover, students nowadays greatly depend on technology as well to gain new knowledge and learn on their own pace with less assistance from the educators (Miriam, Rhoades, Sweeney, Kaput, & Yaneer, 2002; Nathan, Anastase, Vedaste, & Innocent, 2015). Hence, through this study, lecturers and undergraduates will be able to identify the antecedents that influences ICT usage for self-paced learning. The students will be able to device the factors that influence their ICT use for self-paced learning process in order to boost and achieve a greater academic performance whereas lecturers can understand the student's point of view on the issues of ICT use for self-paced leaning.

Moreover, this study has applied TAM. It will be able to contribute to the present knowledge of TAM as the model is adapted and used to study the factors that influence undergraduates use of ICT for self-paced learning. Additionally, TAM body of knowledge is expended through the additional of other external variables such as motivation, mastery, and subjective norm. Besides this, the relationship among the factors can be identified and necessary steps can be taken by the stakeholders to further encourage and maximize the usage of ICT for self-paced learning among undergraduates.

This study is significant as it also provides future researchers in generating new point of view which results in more research concerning in the area of ICT use for self-

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paced learning. The study will also serve as a meaningful guidance and support to the teachers, principals, parents, ministry officers and leaders with the purpose to maximize the students' learning. Hence, these research findings can be adapted into other various field that concerns with learning, as it is not only limited to tertiary education context but educational training centers and other specific and general agencies as well that deals with teaching and learning. Apart from that, this study may discover new paths that are not established in the literature reviews or past studies. It may provide useful data for the professional bodies to ponder upon and develop on new strategies that can be used to maximize the usage of ICT for self-paced learning among the students. Indirectly, the new finding in this investigation will give rise to new suggestions over the existing learning environment for the stakeholders.

Since this study is in line with the Malaysia Education Blueprint 2013-2015 as well, it will be able to provide fundamental information on self-paced learning among Malaysian undergraduates for the government, as tertiary education is still under its judiciary as the government funds 60% of the tertiary education (Ministry of Higher Education, 2009). The government has also created policies and plans to make sure that HEIs are supported to undertake changes and accomplish merit to face the challenges posed by the worldwide education market (Ministry of Higher Education, 2007). This study also indirectly or directly will serve as a reference point to ensure that Malaysian universities' undergraduates are to achieve world-class status and par with other universities around Southeast Asia region (Ministry of Higher Education, 2007). Overall, it can facilitate the stakeholders to provide supportive, effective and affordable learning that can take place anywhere and at any time to stay competitive in the global economy.

Finally, this investigation also hopes to bridge the literature gap that is lacking in identifying the determining factors that maximize the usage of ICT for self-paced learning among undergraduates.

1.7 Scope of the Study

This quantitative exploration is to investigate the factors that maximize ICT use for self-paced learning among UTAR undergraduate students from nine faculties across two campuses, which is located in Kampar, Perak and Sungai Long, Selangor. The projected research model is based on TAM model by Davis (1989). Quantitative data were obtained through adaption and self-developed questionnaires from previous studies related to ICT acceptance in education. Some of the constructs were self-developed due to the scarce literature review found. The obtained data were analyzed using Structural Equation Modelling (SEM) approach.

1.8 Definition of Terms

1.8.1 Self-paced Learning

An approach to content delivery that tries to give students the capability to progress through materials at their own speed rate rather than a rate fixed by the teacher (Magil, 2008). Current study researcher viewed that learning should not only focused through traditional learning method, but rather individualistic learning which allows the students to learn in their own pace. Students nowadays tend to outsource while they are learning and do not only depend on their lecturers. This is done through internet and other online platform to enhance their understanding towards a subject or topic in their own pace. Thus, self-paced learning in this present study refers learning that the students participate on their own pace before, during, and after of a formal learning hours such as lectures and tutorials.

1.8.2 Maximizing Information and Communication Technology (ICT) Use

Information and Communication Technology (ICT) is a diverse set of technology tools and resources (Blurton, 2005) such as television, radio, mobile phones, computer and internet, hardware and software, satellite systems and related systems (Jo, 2013) that allow people to communicate, create, publish, manage and store data, information, and knowledge (Blurton, 2005; Yu, 2010). In this current study, maximizing ICT use refers to any use of devices, networks hardware and software to the highest possible utilization rate such as using it every day or almost every day for efficient management of knowledge for self-paced learning among undergraduate students.

1.8.3 Mastery

Mastery can be referred to the observable performance on a set of items or tasks associated to a certain concept, skill, or subject (Thomas & Eric, 2014). Figueiredo and Ipiranga (2015) defined that mastery is practical knowledge which consist of compressive practical knowledge to execute some skills using bodily activities. In this present study, mastery refers to the students' practical knowledge and operating skills to use ICT for self-paced learning.

1.8.4 Motivation

Motivation is a process whereby goal-directed activity is initiated and sustained in a person behaviour to do something consciously that might benefit them or others (Atkinson, 2000; Schunk, Pintrich, & Meece, 2008). Key to promoting of lifelong learning for academic success is through motivation (Sanacore, 2008). In this present study, motivation is treated as a goal-directed activity initiated and sustained by undergraduate students to use ICT for self-paced learning.

1.8.5 Subjective Norm

The degree to which a person identifies others who are significant in their life to decide whether to perform or not the behaviour in question (Schepers & Wetzels, 2007; Huang, Davison, & Gu, 2008; Punnoose, 2012). In this study, it refers to an undergraduate's perceive importance of significant others such as lecturers, peers, and parents in his or her life whom they think he or she should use ICT for self-paced learning.

1.8.6 Perceived Usefulness

The degree to which a person trusts that using a system will aid them to improve their efficiency (Davis, 1989; Henderson & Megan, 2003; Park, 2009). Thus the definition for perceived usefulness in this study refers to the degree of undergraduates' feeling of worthiness with the associated use of ICT for self-paced learning in the university will improve their learning process.

1.8.7 Perceived Ease of Use

The degree of easiness linked by a person with the use of the system (Davis, 1989; Henderson & Megan, 2003). In this present study, perceived ease of use refers to the extent that the undergraduates believe that utilizing ICT for self-paced learning would be effortless.

1.8.8 Attitude towards using ICT

Individual's positive or negative response about carrying out the target behaviour using a certain system, and object (Eagly, & Chaiken, 1993; Venkatesh, Morris, Davis, & Davis, 2003; McLeod, 2018). According to Moses (2012), attitude refers to mixture of belief, thoughts and feelings of the users in a favourable or unfavourable way for the purpose of

teaching and learning process. In this study, attitude refers to the mixture of students' belief, thoughts, and feeling of using ICT for self-paced learning.

1.8.9 Behavioural Intention to Use ICT

Behavioural intention to use (Tsai, 2012) ICT or technology (Teo, 2011) is defined as the individual willingness to use (Tsai, 2010) and an individual's subjective likelihood of accomplishing a specified behaviour which leads to actual usage behaviour (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003; Yi, Jackson, Park, & Probst, 2006; Tang & Chiang, 2009). In this study, behaviour intention refers to the undergraduates' willingness to use ICT in the near future for self-paced learning.

1.8.10 Actual ICT Use

Actual system use is a behavioural response, defined as a form of conscious mental activity reaction that is enumerated by a person in real course of action (Davis, 1989; Chuttur, 2009). Actual system use in this study will be referring to the undergraduate students' real use of ICT for their self-paced learning.

1.8.11 Undergraduates

According to statistics provided by Ministry of Education (2015), undergraduates are students aged from 20 - 23 years old and a student who are undergoing diploma, advance diploma, and degree programmes in a college or university. In this study, students enrolled in degree programmes from nine faculties namely; Faculty of Science, Faculty of Creative Industries, Faculty of Business and Finance, Faculty of Arts and Social Sciences, Faculty of Medicine and Health Sciences, Faculty of Accountancy and Management, Faculty of Engineering and Green Technology, Lee Kong Chian Faculty of Engineering and Science, and Faculty of Information and Communication Technology participated in this study.

CHAPTER 2
LITERATURE REVIEW

2.1 ICT in Education

In the earlier stage of education, knowledge has been taught and accessed by learners through textbook, face-to-face, and workbooks in the classroom, but with the incorporation of ICT in learning process, the learners are more engaging in their lessons (Shinagawa, 2012). ICT has become the center of attention to seek for knowledge and they have been playing the role of a guide for information seekers and students alike compared to last three decades where it was done traditionally by lecturers and tutors who were the main source of reference.

Moreover, the dramatic and pivotal advancement of technology has a tremendous impact on today's society that the younger generations are depending significantly on them that they have become a part of today's modern society (Heyneman & Haynes, 2004). This advanced 21st century ideally allows students to use ICT in their learning process whenever they have the opportunity without much resistance from the educators, as they are aware of the benefit it brings. Furthermore, technology is also identified as one of the vital element that leads to a more efficacious learning outcome of the students for the past two decades by researchers in the educational technology field (Glenn, D'Agostino, & Johnson, 2009; Teo & Lee, 2010).

Besides, ICT integration into education because of rapid expansion of ICT and connectivity has caused globalization of education (Matthew, Joro, & Manasseh, 2015). This have led students to gain access to materials all over the world and not physically bound to the library resources. Thus, more knowledge are gained and exchanged among students worldwide and indirectly leading to borderless learning. Through the sharing of

knowledge among fellow students, a robust change to the current world and future can be done by the youngsters as the education foundation is firmly molded with ICT integration. Due to globalization of education, the use of ICT in learning process allows vibrant and energetic ways of virtual communication and spontaneous partnership among individuals across the world in order to share and expand their horizon in accepting new knowledge, as ICT is readily accessible (Glenn, D'Agostino, & Johnson, 2009).

Chapman, Garrett and Mählckv (2004) viewed ICT as a role model for students to be engaged and motivated for continuous learning without any form of hindrance or difficulty. The students are also attracted to further use ICT which allows them to have a more refined usage to obtaining a new knowledge. Without hindrance in using ICT tools especially the commonly found smartphones, tablets, and laptops means that it has an immeasurable patience and never biased towards gender, ethnicity, or social status except for technical issues like battery lifespan and constant updates for better performance for the tools itself.

Technology users are never failed to receive immediate feedback such as getting latest information or finding materials for education purposes. Users can use education software at their own pace, space, time and necessity to learn new knowledge (Adobe Systems Incorporated, 2009). Thus, the integration of technologies into learning is gradually being comprehended among educators, adult learners and especially students as they learn that ICT could give them assistance in their learning process (Thornton & Houser, 2005). With ICT, students are given the chance to steer their own learning progress with their own pace and thus gaining personalized learning experiences.

Today's generation of students would rely on the internet in order to connect with the world as the internet has become a source to seek information and educational materials. Moreover, in today's ICT-enabled society, it offers myriad of fascinating replacement approaches to improve education for students of all levels especially for those in higher education institutions. Moreover, 75% of the vast majority of adults learn through seeing, whereas 13% of them learn through other senses such as touch and taste (Laird, 1985). Laird (1985) stated that the use of internet by the students to publish a research project via a website results in connecting them to the real world and enhancing the students' organizational skills. He further added that the involvement of technology in learning process allows the student to have or foster a better understanding about how the World Wide Web works. Therefore, this strengthens even more the need for maximization of ICT usage in self-paced learning among students.

2.2 ICT Education Policy in Malaysia

In recent period of time, developing countries are moving their importance towards the growth of science and ICT (Olatubosun, Olusoga & Shemi, 2014). According to Olufunke and Esther (2015), ICT is viewed as an instrument that can accelerate the development of the nation. This statement can be the reason behind the special attention given for such educational shift by developing countries such as Malaysia, Thailand, and Indonesia.

The Malaysian government is mindful of the importance of ICT utilization in education as delivery of education resources. Through ICT, it will be able to deliver instantaneous, up-to date information, by using one or more tools to a vast number of learners easily and without incurring major cost. Thus, polices were drawn and refined further for the existing ones by the Malaysian government under the Ministry of Education (MOE) to embrace ICT in education context (Ministry of Education, 2013).

It is clear that Malaysia's MOE had made an effort for an educational reform through the use of ICT in learning. The effort by MOE is greatly justified that any society in this world that wants to achieve faster growth, education needs to be heavily invested. Over the 60 years of independence, the Malaysian government have sustained a high level of investment in education. For an example, in 2012, Malaysian government have spent RM37 billion or 3.8% as a percentage of Gross Domestic Product (GDP) for education (Ministry of Education, 2012). This shows the very real obligation of the government has for education as a national priority. With Vision 2020 to be achieved in two years' time, Malaysia is evidently working harder towards achieving the goal of becoming a technology driven country to strengthen education system through the use of ICT. As Malaysia's education landscape is intertwined in a school of diverse learning backgrounds due to the land's multi-faceted society. Moreover, a typical Malaysian classroom consists of diverse learners who are not only differ linguistically and culturally but also in their cognitive capabilities, contextual knowledge and learning preferences in all level of education phases such as primary, secondary and tertiary. The Malaysian education body have explored various strategies to ensure that throughout the learning process in education institutions are maintained at high level for engagement and motivation. One of the effort was implementing the use of computer system in learning.

In 1966, Malaysia executed the first computer system and along the way they have also introduced numerous initiatives to endorse the usage of ICT and develop the field of education (Chan, 2002). One of the initiatives to spearhead government's ICT agenda in education was ICT-enabled Smart Schools. The purpose of these Smart Schools is to support the nation to accomplish the intentions of the National Philosophy of Education and to nurture growth of a workforce equipped to encounter the challenges of the 21st

century. To further encourage active participation of schools, Ministry of Education formulated a measurable and gradable benchmark of ICT utilization of the smart schools known as Smart School Qualification Standards (SSQS). The standards that are used to measure SSQS are based on the use of ICT, competency of users, and adoption of applications provided by MOE.

Under the ICT policy as well, Ministry of Education also have produced a diverse instructional and learning resources such as interactive CD ROMs, audio CD, , and web-based multimedia contents as well as giving access to online learning materials. Besides this, educators and learners have access to a collection of ICT tools at their conveniences such as laptops and projectors for electronic presentation during the teaching and learning process. They have access to web editing facilities, emails, forums, and databases as internet is provided (Ministry of Education, 2012). Ministry employed ICT to make lessons more interesting, suitable, and expressive for the students and the teacher as well. Policy makers comprehended that ICT have the capability of bringing the world into the four walls of a classrooms. Thus, ICT provides the access to quality learning and teaching materials to the areas not reachable by traditional means; and ultimately improve information literacy for the students in their learning process.

Constant encouragement from the government and teachers to use ICT in learning during primary and secondary schooling have prepared the students for further education in higher education institutions. Through these policies outcomes, the ministry has an ultimate objective to achieve improved student outcomes using ICT in education as made explicit in one of the National Key Result Area (NKRAs) in Government Transformation Programme (GTP) (Grapragasem, Krishnan & Mansor, 2014).

As of the year 2014 statistics provided by Ministry of Education, Malaysia has 410 private colleges, 70 private universities, 34 private university-colleges, 14 higher institutions centers of excellence (HICoE), 33 polytechnics, 91 community colleges, and 20 public universities (Ministry of Education, 2015). With the release of the Malaysia Education Blueprint (2015-2025), Malaysia is seeking to alter the current education structure to be similar with those of established nations such as United Kingdom and Australia.

With over 500 institutions established and 1.2 million students enrolled in higher education and training due to massification of higher education (Ministry of Education, 2015), the higher education sector in Malaysia is growing exponentially as a superior education center in Asian region for the past decade and is developing the means to meet the goals of strategies like the Economic Transformation Programme (ETP) (Ministry of Education, 2015).

To secure Malaysia's position as a global education hub, its visions promotes the improvement of academics and institutional excellences. One of the agenda to achieve the vision is to promote online learning through the use of ICT (Ministry of Education, 2015). Through the promotion of online learning, it gives the learners the opportunity to learn and gain knowledge on their own as the emphasis is on student-centered learning rather than the conventional manner of educator-centered teaching (Lai, 2011). Moreover, for the past few decades, learning has been seen as a constructive process which allows the learners to actively participate in the learning process and construct knowledge through the use of technologies (Scardamalia & Bereiter, 2006; Lai, 2011).

As a move to integrate ICT into education and as well to encourage the use of ICT the general public, the implementation of National broadband master plan was done and

resulted in 77.6% penetration rate for broadband services in the year 2015 (Malaysian Communications and Multimedia Commission, 2015). The government carried out this initiative as it acknowledges enhanced networking is vital for ICT integration in education. It allows the students and teachers to utilize fully the facilities provided by the government for teaching and learning. Students benefit the most from these initiatives as they can have access to abundance of information 24 hours and not limited to formal learning hours. Learning can take place anywhere and anytime due to this ICT initiative (Sarkar, 2012).

Through the ICT initiatives and policies drawn by the government for higher education, it has ultimately led to educational opportunities that benefited the students. The students are able to access knowledge whenever and wherever they need to and access to reserved educational capital. With the invention of World Wide Web (WWW), it is now feasible to gain access to unlimited amount of data and education material such as open access journal, dissertations, and e-books. It also offers data from variety of subjects and in diverse form of media (Dalal, 2016). Educational institutions in the developing countries predominantly need the help of online materials as some have restricted and outdated materials in their libraries (Sarkar, 2012). With ICT policies in place and refined, the higher education providers both government and private establishment can cater and serve to particular needs of the students in terms of study pace and learning style. Thus, it allows a more individualized learning for the student who pursue higher education and mold them to be a holistic person in this knowledge-based society.

2.3 The 21st Century Student

A 21st century student regularly spend around six hours a day reading print materials, electronics, broadcast, and news media (OECD, 2015). Students and ICT nowadays goes hand in hand as the student views and creates content to be published in internet, finding

materials for their assignments, and saturate themselves with news and educational channels by watching television through Malaysia's very own pay satellite TV service provider- Astro. It opens a completely new paradigm in reaching the other side of the world without physically moving away from their comfort zone. Additionally, introduction of smartphones further pushed the definition of being virtually everywhere in this world. Through smartphones, information are disseminated in speed of light as technology genius generates new applications now and then. It allows the youth or students to keep in touch all day through instant message application such as WeChat, Snapchat, WhatsApp, Instagram, and Facebook messenger. This alone shows the advancement in the ICT industry within these two decades.

Through the introduction of such technologies, students are no longer the students who acquire knowledge 100% from their lecturers and printed hardcopy of books but rather through the abundant ICT content such as education portals, unlimited portals, and websites of information and journals for their intellectual consumption. Moreover, a student no longer study each subject in isolation but as an alternative, they work on multidisciplinary assignments that uses information and skills from a variation of issues and address a number of important academic assignments given to them by their educators. As such, educators are slowly diminishing from the function of being a lecturer to a facilitator of learning. The students are learning by doing and the lecturers' are acting as a facilitator by helping rather than spoon-feeding students as they work on assignments. Students learn to use the inquiry technique, and to team up with others to achieve a common goal, which is a micro-level of the world reality they will experience after they graduate.

The 21st century students or millennials are proficient users of digital technology (OECD, 2015). Millennial generation are the first group of people to be saturated with ICT

(Rideout, Roberts & Foehr, 2005). Part of the people lives who belong to this generation were always connected to ICT as they have the access to it. This is due to the expectation that it will support their learning process as they are able to gather and use online information without much hindrance. They can be more functional with smartphones, handheld devices such as iPad, tablets and other wireless devices than they can have done using a traditional method.

Another currently noticeable phenomenon that is occurring and can be regularly observed among students in universities is the use of the term "Google it" to seek answers when asked a question. Students greatly accept technology, adapt it to suit their need and thus using it as a tool to find the information they need to complete a task with few effortless steps. Few decades of ago, researchers were concern with how new technology work but now they are looking into how it can be part of everything that concerns human evolution. In another term to describe this situation is that the students are thinking differently from their predecessors in term of using ICT to assist them in a daily basis and how ICT can individualize their learning process. As such in the context of higher education, students are contributing to a vital role by providing information on how technologies should be utilized to suit their current learning process and best meet their needs (Gros & Lopez, 2016).

Younger generation today are brave enough to take up a risk compared to their seniors (Steinberg, 2007). They have a different set of mentality that makes them to try again if they fail and repeat the same action until they achieve what they set to gain. The parents of the risk taking younger generation will never want to do what their son or daughter are doing in their youth time as trial and error will cause wastage of time for the parents as ICT was not made readily available for them like at this present time.

Students in this era of ICT integration are practiced users of digital technology which allow them to be wide open to a whole new learning paradigm that improve their quality of life. This is allowed to happen as students greatly accept technology into their life and willing to take risk and they are not afraid of failure as they believe hard work yields solution that they need. Brown (2001) viewed:

> Today's digital kids think of Information and Communications Technology (ICT) as something akin to oxygen: they expect it, it's what they breathe, and it's how they live. They use ICT to meet, play, date, and learn. It's an integral part of their social life; it's how they acknowledge each other and form their personal identities. Furthermore, ICT to some degree has been supporting their learning activities since their first Web search and surf years ago. (p.70).

In conclusion, students are becoming tech savvy and are no longer depend on lecturers and books in the library but use ICT as an assistance in finding and gathering the information they need through the Internet. Instead of being kept for assignments and projects, ICT tools are impeccably integrated into students' daily instruction and importantly to suit their learning style as ICT has the potential to deepen skills and engross students in learning (Rhema & Miliszewska, 2014).

2.4 Self-paced Learning

Self-paced learning permits students to progress through their learning materials at their own pace compared to the conventional learning method (Magil, 2008). The process of self-paced learning occurs before, during and after a lesson that is outside of the formal learning period of a tertiary education establishment. The students create a convenient and active learning process as they set their own goals and objectives to achieve their targeted achievements. With the advancement of ICT in teaching and learning, it is often used by

the students to support their self-paced learning. According to Bautista (2015), self-paced learning archetype enhances students' performances and becomes a potent tool in optimizing classroom instruction. Apart from that, self-paced learning was also proven to have a better recall performance (de Jonge, Tabbers, Pecher, Jang, & Zeelenberg, 2015). As aforementioned, ICT tools have become part of students' life and they are often used to gain information and to suit ones' learning pattern. Learning pattern is an individual's natural pattern of attaining a new knowledge (Sywelem, Al-Harbi & Fathema, 2012). Different sets of people have different sets of learning styles. Some learn by reading, by hearing, by writing while many others by watching. Technology such as ICT helps student to adopt their own learning style and be comfortable while engaging in new knowledge or set of skills (Santosh, 2013).

Student's individual learning style differences influence both their learning and their academic achievement (Alhajri, Counsell & Liu, 2013). Educators have recognized each person have different learning style and techniques to acquire knowledge. They also have agreed that a student might have mixed learning styles with a dominant learning style. Students have also known to change their learning style over the period and under different circumstances. In 1992, Neil Fleming and C Mills developed the VARK modes which acronym refers to Visual, Aural, Read/Write and Kinesthetic. Under the visual category, learners process information if it can be seen or visualized using images, graphs, flowcharts, mind maps and pictures. Whereas, learners who learn by listening are best suited to lecturing style because the information are presented verbally. They can also benefit from recording system as they can playback the information that they have recorded for better comprehension. This type of learners likes to talk about what they have learned so that that they can hear it back.

Read or write learners are visual but they prefer for the written word. Thses learners love to take note during their lesson period as they can refer when they need it. Majority source of information on the internet are text based and it is generally a Mecca of knowledge awaiting for these learners. Learners who fall under the kinesthetic category will like to obtain their information through experiences and practices. Learning happens best for them when demonstrations, videos, and case studies are presented. Every student with different type of learning style can have a personalized learning through the use of ICT and the learning process can be more independent and self-paced (Soyemi, Ogunyinka & Soyemi, 2011). Development and implementation of ICT in all areas of learning activities have made students learning process more individualized and catered to students with different learning styles as well (Pogarcic, Sepic & Raspor, 2009).

2.5 Theoretical Framework

Several theoretical perspectives have been created to comprehend the behavioural intention of learners towards the use of technology (Abedalla, 2015). Literature review was done on a variation of theoretical models and frameworks used by education technology scholars. The findings suggested that majority of the framework used in the educational technology research area concerns with Technology Acceptance Model (TAM) (Al-Adwan, Al-Adwan, & Smedley, 2013; Alharbi & Drew, 2014; Soleimani, Ismail, & Mustaffa., 2014; Zaremohzzabieh et al., 2015; Abdullah & Ward, 2016; Asare, Yun-Fei, Boadi, & Aboagye, 2016; Al-Gahtani, 2016; Dastjerdi, 2016; George & Ogunniyi, 2016; Olushola & Abiola, 2017; Al-Azawei, Parslow & lundqvist, 2017; Nagy, 2017; Gan & Balakrishnan, 2017; Sivo, Ku, & Acharya, 2018; Vululleh, 2018; Fathali, & Okada, 2018; Poellhuber, Fournier St-Laurent & Roy, 2018)(Figure 2.1). Apart from that, Marangunić and Granić (2015) examined 85 scientific publications on TAM from the year 1986 to 2013 and determined

that research studies have continually identified new constructs that had significant role in influencing the core variables (perceived usefulness and perceived ease of use) of TAM. These numerous study have validated the authenticity of TAM and provides the basis for the researcher to apply them in this investigation.
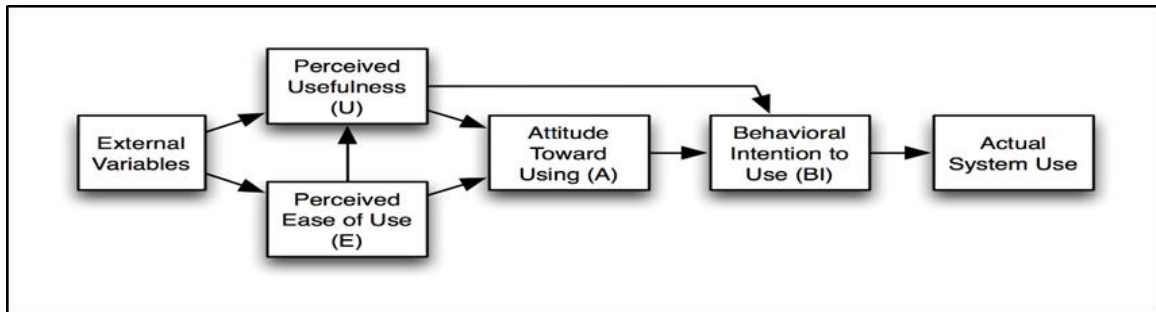
Figure 2.1 Original Technology Acceptance Model. Adapted from "User Acceptance Of Computer Technology: A Comparison of Two Theoretical Models" by Davis, Bogozzi and Warshaw, 1989, *Manegement Science*, *35*(8), p. 982-1002. Reprinted [or adapted] with permission.

In 1989, Davis et al. adapted Ajzen and Fishbein's Theory of Reasoned Action (TRA) and developed it into TAM to predict the technology acceptance among users (Samaradiwakara & Gunawardena, 2014; Akinde, 2016). The robust yet parsimonious theory Technology Acceptance Model is suitable to describe a particular information system or technology (Chen, Li, & Li, 2011; Tang & Hsiao, 2016). According to Leong and Huang (2002), TAM outperformed TRA in a bigger set of measures which enable a strong basis and promising theoretical base to examine the determiners contributing to technology acceptance among technology users.

In a research paper produce by Teo (2013), the researcher have identified several variables that stimulates and rejects the use and recognition of technology use in a person's usage. The variables stands from individual difference, attitudes, beliefs, social influence, and situational influences (Teo, 2013). Moreover, behavior intention is stimulate by the intention to conduct a behavior which can be explained as the actual performance of the

behavior is foreshown by a person's behavioral intention to be involved in the task. In addition, Ducey and Coovert (2016) have mentioned that TAM can be used in an institution to measure the responses towards what prompts curiosity of students to utilize the technology and lead to actual use (Aggorowati, Suhartono, & Gautama, 2012).

Moreover, TAM proposed that an individual's attitude towards adapting a new technology is determined by two antecedents, namely, perceived usefulness and perceived ease of use (Davis, Bagozzi, & Warshaw, 1989). Both of the antecedents acts as independent variables while the system usage or in this study; actual usage of ICT will be the dependent variable. Both of these factors was retained in this study as it has a high relevance in technology receiving behaviour to use a system (Beldad & Hegner, 2018), which was investigated in this study. The revised version of the model also was extended by incorporating a range of external variables (Venkatesh & Davis, 2000; Venkatesh, 2000; Venkatesh & Morris, 2000; Venkatesh, Morris, Davis, & Davis, 2003; Teo, 2013; Al-Sayyed & Abdalhaq, 2016; He, Chen & Kitkuakul, 2018) as to provide a stronger model (Legris, Imgham, & Colleretteet, 2003). Hence, the theoretical insights of TAM were used in this study as it is a well-acknowledged base and a parsimonious theoretical explanatory model, which inserts the predicting determiners such as perceived usefulness, perceived ease of use, attitude, and other external variables to examine the variables that determine and contribute towards the use of ICT for self-paced learning among the undergraduates.

By using TAM in this study, the researcher seeks a potential contribution to add more external variables namely, mastery, motivation and subjective norm into the literature gap of TAM and to provide an insightful understanding for clarifying behaviors that predicts technology usage as suggested by Davis in 1989. Moreover, the researcher also used and extended the TAM model in hope that it will serve as a reference point for future

researchers while making research studies in the area of educational technology and creating their own models for improvement, dissemination and recognition.

2.5.1 Perceived Usefulness

Perceived usefulness is a concept tied to an evaluation of the benefits that results to an individual by utilizing the technology (Punnoose, 2012). Punnoose (2012), Fathema, Shannon, and Ross (2015, and Abdullah, Ward, and Ahmed (2016) studies found that perceived usefulness influenced students' behaviour intention to use technology. Apart from the three mentioned studies, other studies that used perceived usefulness variable to predict technology usage also yield the same outcome (Lee & Chai, 2008; Afshari, 2009; Park, 2009; Godoe & Johansen, 2012; Khayati, 2013; Teo & Alharbi & Drew, 2014; Lee, Hsiao & Purnomo, 2014; Al-Azawei, Parslow & lundqvist, 2017; Budu, Yinping, & Mireku, 2018). Moreover, fellow researchers have found that perceived usefulness have direct influence for attitude towards use (Fathema, Shannon, & Ross, 2015; Alalwan, Rana, Algharabat, & Tarhini, 2016; Abdullah, Ward, & Ahmed, 2016; Masa'deh, Tarhini, Mohammed, & Maqableh, 2016; Nagy, 2017; Sivo, Ku & Acharya, 2018).

2.5.2 Perceived Ease of Use

Perceived ease of use is the degree to which an individual trusts that consuming a specific system would be free from effort (Davis, 1989). Researchers viewed that perceived ease of use plays a vital role in contributing indirectly to use technology (Abdullah & Ward, 2016; Esterhuyse & Scholtz, 2016; Masa'deh, Tarhini, Mohammed, & Maqableh, 2016). In Al-Adwan, Al-Adwan, and Smedley (2013) and Fathema, Shannon, and Ross (2015) studies, they have found that perceived ease of use has a substantial influence on student's attitude and perceived usefulness simultaneously. Moreover, in a 2014 study by Juniwati showed perceived ease of use was also found to influence attitude towards use.

2.5.3 Attitude towards Using ICT

In recent study conducted in United Kingdom by Edmunds, Thorp, and Conole (2012), the TAM was applied to understand students' attitude towards the use of ICT. The study revealed that students have a positive attitude towards ICT use. Sandholtz, Ringstaff, and Dwyer (1997) investigation revealed that students had some positive changes in terms of attitude as their interest in school assignments and projects extended to the last week of school as they became very involved with computers. The students' positive attitude lead to a greater enthusiasm which resulted in a better on-task behaviour and they were frequently engaged with their assignment with little assistance (Sandholtz, Ringstaff, & Dwyer, 1997). In other studies conducted by Guritno and Siringoringo (2013), Fathema, Shannon, and Ross (2015), and Sivo, Ku & Acharya, 2018, found attitude towards using ICT had direct influence on behavioural intention to use. Attitude is also among the strongest predicator that is influential in technology usage and further suggests that a technology user should have a positive attitude before utilizing ICT (Davis, Bagozzi, & Warshaw, 1989; Teo, Lee & Chai, 2008; Sang, Valcke, van Braak, & Tondeur, 2010; Malathi & Rohani, 2011; Buabeng-Andoh, 2012; Ahmed, Kamal, Nik Suryani, & Tunku, 2011; Sujeet & Jyoti, 2013; Altawallbeh, Soon, Thiam, & Alshourah, 2015; Hussein, 2015). The positive attitude among the students will increase their involvement of using ICT or technology as it increases the initiative and the risk-taking ability of the students to work beyond the requirement for their projects and allows the students to develop new skills which leads them to independently find new application to assist and complete their learning process (Sandholtz, Ringstaff, & Dwyer, 1997).

2.5.4 Behavioural Intention to Use ICT

TAM proposed that computer utilization is confirmed by behavioural intention to use, which forecasts a user's intention to execute an intended act such as making a decision to agree to take and use an information system (Erasmus, Rothmann, & Van Eeden, 2015). Behavioural intention to use has been found to accurately predict the actual use of a computer information system (Yu, Li, & Gagnonc, 2009; Guritno & Siringoringo, 2013; Fathema, Shannon, & Ross, 2015; Sivo, Ku & Acharya, 2018) and have a larger influence on actual usage of technology (Tarhini, Elyas, Akour, & Al-Salti, 2016). According to Bagozzi (2007), scholars in social science researches and information systems researches have accepted that behavioral intention leads to the actual use. Apart from that, Venkatesh, Marris, Davis, and Davis (2003, p. 427) stated that "role of intention as predictor of behavior…. has been well established " and Ajzen and Fishbein (1980, p. 41) stated that "intention is the immediate determinant of behavior." Thus, in this study behavioural intention development is to measure of the actual use behaviors of students using ICT for self-paced learning. Previous researchers have used behavioral intention to quantify actual behavior of users such as Dinev and Hu (2007), Herath and Rao (2009), Johnston and Warkentin (2010), Ifinedo (2012), Warkentin, Straub, and Malimage (2012), Sharma and Crossler (2014).

Apart from the existing variable in TAM, various study proved that other independent variables might also play a role in influencing technology use among students (Bonk, 2002; Hu, 2008; Sharma, Sharma, & Seema, 2011; Punnoose, 2012; Edgar, 2018; Alhquish, 2014; Wilson, Tete-Mensah & Boeteng, 2014; Wilson, 2014; ; Chukwudi, Aaron & Akorede, 2015; Díaz-García, Cebrián-Cifuentes, & Fuster-Palacios, 2016). The other independent variables that are used in this study that plays a role in influencing technology

use are namely; mastery, motivation and subjective norm. These independent variables are discussed in the following sections.

2.5.5 Mastery

Mastery or competence of ICT is relevant to make self-paced learning a success in HEIs (Edgar, 2018; Hakkarainen, Ilomaki, Lipponen, Muukkonen, & Rahikainen, 2000). Over the past decade, the use of ICT has been increasing and heavily invested by stakeholder in developing countries (Deb, 2011) such as Malaysia which the education institutions are constantly pressured to use ICT (Hamzah, Embi, & Ismail, 2010). In Malaysia, ICT usage is exposed as early as from primary school. According to Díaz-García, Cebrián-Cifuentes, and Fuster-Palacios (2016), students who are regularly exposure to the usage of web, computer, and portable device-based technologies will draw a degree of familiarity with the usage skills and attract a lot of interest among them, who then uses it for educational purposes and for social networking as well. Without such ICT skills such as searching and compiling online materials for assignments purpose as an example, it will be difficult for the students to use ICT in their learning process (Means, Bakia, & Murphy, 2014). Thus, mastery is included in this study as an external variable. In past studies conducted, competence influenced perceived usefulness of an individual to use technology (Oluwatobi & Yemisi, 2014; Boe, 2016) and perceived ease of use (Oluwatobi, & Yemisi, 2014). Several research studies indicated that students use ICT in their learning process due to their high ICT competence skills (Irfan & Noor Afi, 2012; Griaznova, 2014; Rhema & Miliszewska, 2014; Chukwudi, Aaron & Akorede, 2015; Buabeng-Andoh & Agyekum, 2015; Buabeng-Andoh & Issifu, 2015; Díaz-García, Cebrián-Cifuentes, & Fuster-Palacios, 2016).

2.5.6 Motivation

Motivation is defined as the fuelling force or internal strength behind one's action by one's aspiration for something (Adeyemi, 2014). Motivation is seen as key factors of information system usage in learning (Hashemyolia, Asmuni, Daud, Ayub, & Shah, 2014) and having a tremendous influence on a person's intention to engage in an activity and the outcome of such activity (Chung, 2012). Moreover, motivation variable includes things that closely relate with students' readiness and willingness to use or learn something that will assist them in acquiring new knowledge. With the correct and sufficient level of motivation in students, ICT usage can be brought to the maximum level and to use them as an innovative tool that will help the students to achieve a better outcome for their aspiration. Bousbahi and Alrazgan (2015) reported motivation to influence perceived usefulness of technology among the participants of their study. According to Davis (1993), teachers that are using ICT in their teaching process allows them to gain the students' concentration better in the learning process and at the same time it will motivate the students to spend more time to be engaged in the learning activities as ICT provides multisensory stimulation and real world experiences.

2.5.7 Subjective Norm

Ajzen and Fishbein (1975) defined subjective norm as a belief that an important person's perception will be needed to approve or disapprove to perform the behaviour in question. People will generally intend to comply with perceived social pressure to perform a behaviour when they believe that their significant others think they should do so (Ajzen, 1988; Huang, Davison, & Gu, 2008). Raaij and Schepers (2008) found subjective norm directly influence perceived usefulness. In Punnoose's study (2012), subjective norm found to have direct influence on perceived usefulness and behaviour intention. In several other studies,

subjective norm was also found to have a direct influence on behavioural intention to use (Devaraj, Easley, & Crant, 2008; Huang, Hsiao, Tang, & Lien, 2014; Attuquayefio, Achampong, & Aryeetey, 2014; Hon & Ho, 2015; Al- Ghaith, 2016).

2.9 Conceptual Framework

For a better understanding on the maximization of ICT use among undergraduates, there is a necessity to examine the factors that influence their use of ICT for self-paced learning. From the literature review of past studies, it informs that students who use ICT learned better that those who were not using it. Therefore, this study aimed to propose a research model of the determining factors that influence the use of ICT for self-paced learning among undergraduates using the underlying TAM theoretical mechanisms to share some insights into the understanding of the research topic.

A conceptual framework, shown in Figure 2.2, was drawn based on the TAM and review of various literature. The TAM provides the basis for this investigation and other external variables were included. Thus, seven factors that were found to predict the influence of ICT for self-paced learning are perceived usefulness, perceived ease of use, attitude towards ICT use, behavioral intention to use ICT, mastery, motivation, and subjective norm.
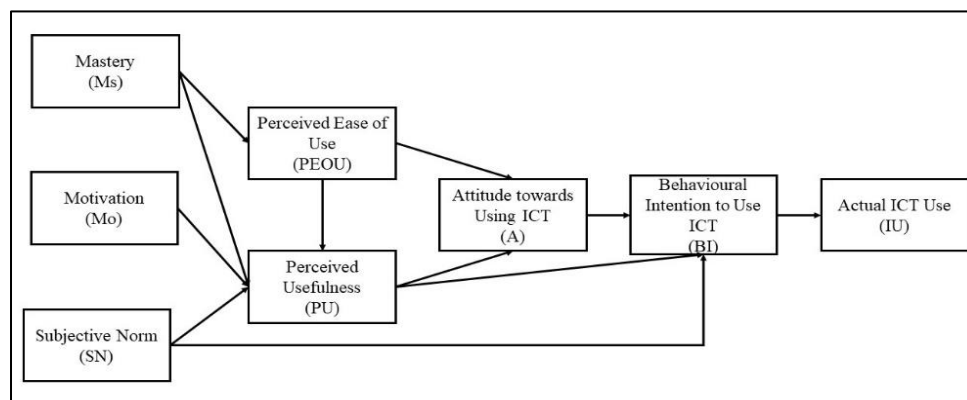
Figure 2.2. Conceptual Framework of the Study

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter presents on the description of the methodologies and techniques used in this research study. The goal of the research is to capture data concerning the variables that maximize ICT usage for self-paced learning among undergraduates by extending the Technology Acceptance Model. This chapter includes the explanation on research design, population, sample size, sampling, instrumentation, validity, reliability, data collection, data entry methods, and statistical measurement techniques.

3.2 Research Design

A reliable and justifiable research design is a necessary for a researcher in order to find the answer for the formulated research problem and at the same time to strengthen the study (Saunders, Lewis, & Thorhill, 2012). Furthermore, several aspects in designing a research, such as research paradigm, research techniques and producers needed to be addressed and it is essential to the progress of a coherent and applicable research design that will have repercussions on the reliability and validity of the investigation and its final results (Saunders, Lewis, & Thorhill, 2012). The researcher has addressed the several aspects needed in designing a research in the subsequent section.

A scientific research study is governed by a paradigm chosen by the researcher (Neuman, 2006). Creswell (2002) described paradigm from the aspect of research as a holistic approach underlying a research methodology. There are three research paradigm in social research namely: (i) positivist; (ii) constructivist; and (iii) critical. This study can be classified under positivist paradigm among the three research paradigm. Positivist

paradigm is the use of scientific approach that uses formulas and statistics to produce reasonable evidence or to test the hypothesis relationship among the factors in the study. In line with the study's intention which is to develop a structural model and to test hypotheses using statistical tools, thus, this study is categorised under positivist paradigm.

The researcher has adopted the use of a quantitative method to achieve the objective of this study. Creswell (2015) stated that quantitative research is the exploration of human or social problems, based on testing a theory that is diversified with numerous relevant variables, measured with numbers and computed using statistical procedures, in order to define whether the extrapolative generalization of the theory is relevant and true. Quantitative study also explains a phenomena or observation using closed-ended checklist (Creswell, 2015). Yin (2003) mentioned that quantitative approach is useful when it comes to test and identify variables that influence results. The definition and explanation given from both Yin (2003) and Creswell (2015) supports the researcher's decision to use quantitative approach, as it is able to achieve the purpose of this study.

Another reason for using quantitative approach was for the strength that it possesses; able to yield factual, dependable result that is customarily generalizable to some greater population (Denzin & Lincoln, 2000; Patton, 2002). One of the advantages of quantitative research over the method of interview is its supremacy in the discovery of the accurate statistical values that can stand the test of general study application and reproduction (Patton, 2002). Thus, a quantitative research design was used in this study.

The nature of this study is cross-sectional study. It provides a snapshot of the dissemination of factors and results in a population at a specified period of time (Matthews & Ross, 2010). Gay, Mills, and Airasian (2014) also defined cross-sectional study as capturing the data of the current behaviours, attitudes, and beliefs in a population in a

quickly manner. The aim of cross-sectional study is to describe a population or a subgroup within the population to an outcome and a set of factors or variables that might trigger an action as in this study on the maximization of ICT usage for self-paced learning among undergraduates. In cross-sectional studies, the sample individuals are not recognized on their outcome status or the presence of a certain factor; rather, the existence of factors and outcomes are determined concurrently (Kanchanaraksa, 2008). Thus, the status of a current trend and phenomenon can be attained through this successfully.

Apart from that, survey method was carried out for this study among the options available in quantitative approach. It has several abilities in a causal research situation. It is also a method that is widely used for education research to obtain data that contains people's opinions on some topic or issue (Ary, Jacobs, Sorensen, & Walker, 2014; Gay, Mills, & Airasian, 2014). According to Hair, Black, Babin, & Anderson (2010) and O' Leary (2014), survey method has the ability to reach a larger respondent group, increase generalizability of the findings, and generate quantifiable, empirical data. Hair, Black, Babin, and Anderson (2010) also viewed survey method have the ability to identify small differences as it has the ability to accommodate a larger sample size, ease of managing and recording questions and answers serves as an advantage over other methods, and most of all, the ability to venture into factors and relationships that are not directly measurable. Survey research method also will have a high response rate and it is suitable to collect data to test hypotheses (Gay, Mills, & Airasian, 2014) and it is cost-effective and reliable (Blackstone, 2012). Hence based on the discussion, survey method was found most applicable and suitable choice of methodology to achieve the objectives of the present study.

As for the technique used for this study to collect data was through self-administrated survey. Research has shown that survey takers are more likely to report delicate or prohibited actions when they are permitted to use a self-administrated survey format rather than during a personal interview on the phone or in person (Wolf, 2011). This self-administrated survey may also yield a higher honest response rate (Hair, Black, Babin, & Anderson, 2010).

3.3 Population

According to Matthews and Ross (2010), population is a collective characteristic that are found within a set of feature in a comprehensive group of people to conduct a research and be the main focus group of the study as well. In a survey methodology, population consists of similar units or sample to which researcher's desires to generalize survey result (Gay, Mills, & Airasian, 2014). In other words, samples can infer the characteristics of a larger group of people or a population for the researcher who is conducting a study (Hair, Black, Babin, Anderson, & Tathum, 2014).

The target population of this study includes all the UTAR undergraduates from nine different faculties from two different campuses. The total undergraduate population as of 30th June 2016 is 20,274 (UTAR Graduation Booklet, 2016). These undergraduates were focused in this study as this education institution embodies multiculturalism spirit whereby the students hail from various education ideologies and locations with various ethnic backgrounds. Before they enter tertiary education establishment, the students have completed their study in secondary schools that are established throughout Malaysia, be it in rural or urban areas such as in a village in Perlis or city like Johor Bahru. The population from this study came from nine different faculties namely; Faculty of Science, Faculty of Creative Industries, Faculty of Business and Finance, Faculty of Arts and Social Sciences,

Faculty of Medicine and Health Sciences, Faculty of Accountancy and Management, Faculty of Engineering and Green Technology, Lee Kong Chian Faculty of Engineering and Science, and Faculty of Information and Communication Technology, across two campuses which are located in Kampar, Perak and Sungai Long, Selangor.

The age of the undergraduates ranged from 19 years old to 23 years old in this study. According to Ministry of Education (2010), majority of governmental institution undergraduate's age range starts from 20 years old, but in this study, the undergraduate's age range starts from 19 years old. This is because they have finished their foundation program or 'A' level study before continuing their undergraduate study in higher education institutions a year earlier compared to other undergraduate students.

Apart from the aforementioned fact, the students are also from various secondary school background, which has different education system and philosophies. In Malaysia, there are four types of education structure, which are government school, private school, vernacular school, and international school. All the mentioned school systems have different education background but the students will eventually come together when it comes to tertiary education establishment. Thus, the selected group of undergraduate participants will be able to provide a diverse set of answers that can be unique for this study.

3.4 Sample

The sample of this research study was 853 undergraduates from nine different faculties belonging to two different UTAR campuses. The accessible number of respondents for this study is well over the number required as it is based on a well-established and published table by Israel (1992) whom hail from University of Florida. The table provided by Isreal in 1992 was reviewed several time and it was published again in the year 2013 (University

of Florida, 2016). As stated in the table for a population of 20,000 people in an establishment similar to the researched private university in this study, it requires 392 people with confidence level of 0.5 to make the research study to have a valid outcome (University of Florida, 2016; Singh & Masuku, 2014).

Moreover, as this study is using SEM technique to analysis the data obtained, the statistical algorithms used by SEM programs can produce unreliable findings with small sample size (Hair, Black, Babin, Anderson, & Tathum, 2014). Hair, Black, Babin, Anderson, and Tathum, (2014) stated that the larger the sample size, the lesser the variability and thus, stability level increases in the findings. Hair, Black, Babin, and Anderson (2014) have also suggested that a minimum of 300 sample is required for a model with seven or lesser constructs. Thus, a sample size of 853 was deemed sufficient to carry out the study.

3.5 Sampling Technique

In the circle of social researchers have been using two types of sampling technique namely probability sampling and non-probability sampling. Probability sampling is based on the idea that individuals and events that are chosen as the sample (Creswell, 2015 & Kumar, 2014) because the researchers have some knowledge of the probability that these will be the typical cross-section of the individuals and occasions in the whole population being studied upon. Whereas for non-probability sampling, the sampling is taken without much background knowledge about those individuals included in the sample size are characteristic of the general population. Thus, the researcher decided to use probability sampling as the basis for selecting sample. Over the several available probability sampling methods, cluster sampling was used as the sampling technique to select the study's sample. With cluster sampling, the researcher divided the population of undergraduates into

separate groups, which in this study refers to the nine faculties available in the private university. Upon dividing the faculties into clusters, the researcher then divided the undergraduate participants in a faculty into different classes which comprises equal number of students. The researcher later randomly chose the classes and contacted the lecturers of the respective classes in the faculty to gain permission to conduct the survey session.

With the sample size recommend of 392 for the population of 20,274 in this study, the collected sample size in this study is beyond the minimum required sample size. Thus, the obtained sample size is proven to be more than adequate for this study to investigate the factors that will maximize the use of ICT for self-paced learning among the undergraduate students.

3.6 Instrumentation

Questionnaire was used in this study as large quantity of potential data from large group of participants can be obtained. This method is also economical and often provide participants with standardized answers to choose from (Olsen, 2012). The key purpose of questionnaire is to apprehend the real thoughts and feelings about subjects that are related to the respondents. The questionnaire (Appendix 1) used in this study was organized into three section (Table 3.1).

Table 3.1

The Components of the Questionnaire

Section A	Section B	Section C
• Demographic Information • Hours of ICT Usage for self-paced learning	• Perceived Usefulness • Perceived Ease of Use • Attitude towards using ICT • Intention to Use • Mastery • Motivation • Subjective Norm	• ICT usage

The structure of the survey begins with the justification of the research, and followed by demographic information in section A. Section A also contain items on ICT usage for self-paced learning. Section B contains seven parts comprising 55 items to measure the factors maximizing the use of ICT for self-paced learning among the undergraduates, namely perceived usefulness, perceived ease of use, attitude towards using ICT, behavioural intention to use ICT, mastery, motivation, and subjective norm. In Table 3.2, it shows the items that were adapted and self-developed by the researcher.

All items for the variable for perceived ease of use, perceived usefulness, attitude towards using ICT, behavioural intention to use ICT, motivation, and subjective norm are measured using five–point Likert scale with anchors from "Strongly disagree" which give the lowest score and highest score goes to "Strongly agree". Whereas for mastery, five point Likert scale with different anchors was used from Rimland (2013) which ranged from "Very Unconfident" to "Very Confident" which shows participants scoring their ICT usage competence by the ticking "very unconfident" as the lowest score and very confident as the highest score. For ICT usage on the other hand, since it measures usage, the scale used

by Vagias (2006) and Lee, Shek, and Rachel (2015) was referred and the scale ranged from "Never or almost never" to "Everyday or almost everyday".

Table 3.2

Research Constructs

Constructs	Items	Authors
Perceived Usefulness	PU1	Adapted From Alharbi & Drew, 2014
	PU2	Adapted From Alharbi & Drew, 2014
	PU3	Adapted From Alharbi & Drew, 2014
	PU4	Adapted From Davis, 1989
	PU5	Adapted From Alharbi & Drew, 2014
	PU6	Adapted From Alharbi & Drew, 2014
	PU7	Self-developed by the researcher
Perceived Ease of Use	PEOU1	Adapted From Davis, 1989
	PEOU2	Adapted From Davis, 1989
	PEOU3	Adapted From Davis, 1989
	PEOU4	Adapted From Alharbi & Drew, 2014
	PEOU5	Adapted From Alharbi & Drew, 2014
	PEOU6	Adapted From Alharbi & Drew, 2014
Attitude towards Using ICT	A1	Adapted from Albirini, 2006
	A2	Self-developed by the researcher
	A3	Adapted From Alharbi & Drew, 2014
	A4	Self-developed by the researcher
	A5	Adapted from Albirini, 2006
	A6	Adapted from Albirini, 2006
Behavioural Intention to Use ICT	BI1	Adapted from Tarhini, Hone, & Liu, 2013
	BI2	Adapted from Tarhini, Hone, & Liu, 2013
	BI3	Adapted from Tarhini, Hone, & Liu, 2013
	BI4	Adapted from Tarhini, Hone, & Liu, 2013
Mastery	Ms1	Adapted from Albirini, 2006
	Ms2	Adapted from Albirini, 2006
	Ms3	Adapted from Albirini, 2006
	Ms4	Adapted from Albirini, 2006
	Ms5	Adapted from Albirini, 2006
	Ms6	Adapted from Albirini, 2006
	Ms7	Adapted from Albirini, 2006
	Ms8	Adapted from Albirini, 2006
	Ms9	Adapted from Albirini, 2006
	Ms10	Adapted from Albirini, 2006
	Ms11	Adapted from Albirini, 2006
	Ms12	Adapted from Albirini, 2006
Motivation	Mo1	Self-developed by the researcher
	Mo2	Self-developed by the researcher
	Mo3	Self-developed by the researcher

	Mo4	Self-developed by the researcher
	Mo5	Self-developed by the researcher
	Mo6	Self-developed by the researcher
	Mo7	Self-developed by the researcher
Subjective Norm	SN1	Adapted from Venkatesh et al., 2003
	SN2	Adapted from Venkatesh et al., 2003
	SN3	Adapted from Venkatesh et al., 2003
	SN4	Adapted from Venkatesh et al., 2003
	SN5	Adapted from Venkatesh et al., 2003
	SN6	Adapted from Venkatesh et al., 2003
ICT Usage	IU1	Adapted from Albirini, 2006
	IU2	Adapted from Albirini, 2006
	IU3	Adapted from Albirini, 2006
	IU4	Adapted from Albirini, 2006
	IU5	Adapted from Albirini, 2006
	IU6	Adapted from Albirini, 2006
	IU7	Adapted from Albirini, 2006

3.6.1 Section A

This section was intended to provide some basic information about the undergraduates. There a total of five items and the first three items covered undergraduates' gender, age, and faculty origin. These information were collected to provide a better insight towards partakes of this research study. It is then followed by two questions that the participant needs to answer in relation to the usage of ICT for self-paced learning. If the respondents answered yes, they will be included in the study, whereas, if the respondents answered no, they will be excluded from the study. Apart from that, the respondents were also asked on their ICT usage for learning process in a weekly basis. The respondents were required to choose among the five choice of time amount they spend on using ICT usage from the provided time range which the researcher synthesized after referring to several questionnaires and concluded that majority of the questionnaires consist of a time range between an hour to two hours. The researcher adapted the time range from Nguyen and Tri (2014) study as the purpose of the study conducted is similar to this part of the investigation and the study context is within Asia region which has similar culture and 12 years of formal

learning education system. The researcher provided the time range that starts from more than 30 minutes to less than 2 hours; more than two hours to less than four hours; more than four hours to less than six hours; more than six hours, and the respondents were also given the choice to check the never option.

3.6.2 Section B

This section concerns with the use of ICT for self-paced learning. There are total of seven different areas or factors identified by the researcher. All of the seven different areas needs to be answered by the students. The items used in this survey was adapted from various research survey forms done by other prominent researchers and the items were contextualized according to this study's objective. Permissions were obtained from the original authors to use and to modify the items.

3.6.2.1 Perceived Usefulness

This part was designed to access the undergraduates' perceived usefulness of ICT for self-paced learning. The items for perceived usefulness was adapted from the instrument generated by Alharbi and Drew (2014) which had an internal consistency reliability reading of 0.92. The researcher obtained the author's permission to use and modify the items. Seven items can be found under this section for this study. Item PU7 was self-developed by the researcher. Each of the item in this study was designed using Likert scale of 1-5. The Likert scale is formulated by using five-interval scale of 'strongly agree' with the value of 5, 'agree' with the value of 4, 'neutral' with the value of 3, 'disagree' with the value of 2, and 'strongly disagree' with the value of 1, whereby students are required to fill in the blanks by using a tick in the box provided next to the statement in construct category. The overall scoring for these items are highest (5), high (4), neutral(3), low (2), and lowest (1). If the participant chose strongly agree to the statement in this section, students perceive that ICT

use is very useful and vice versa if they score low which implies ICT is not useful when it comes to self-paced learning.

Table 3.3

Items for Perceived Usefulness

Code	Items
PU1	I would find ICT usage useful in my self-paced learning process.
PU2	The use of ICT enables me to increase productivity in self-paced learning more quickly.
PU3	Using ICT improves my study performances.
PU4	ICT gives me a greater control over my self-paced learning.
PU5	I find ICT a useful tool for my self-paced learning in my course of study.
PU6	Using ICT enhances the effectiveness of my self-paced learning process.
PU7	Overall, I find ICT to be advantageous for my self-paced learning overall.

3.6.2.2 Perceived Ease of Use

The questions for this section were revised from the instrument developed by Davis in 1989. The internal reliability reading was 0.86 for the original items. The items for perceived ease of use was used to gain insight of the students' perceived ease of use of ICT for self-paced learning. Prior permission was gained from the authors of the original questionnaire developers and it was modified according the objectives of this study. There are six items found under this section. The respondents ticked the scale according to their perceived ease of use on each item from strongly disagree to strongly agree which is highest to lowest. The higher the value they score, they perceive that ICT is easy to use for self-paced learning process and vice versa. The scale scores as follows: 'strongly agree' with the value of 5, 'agree' with the value of 4, 'neutral' with the value of 3, 'disagree' with the value of 2, and 'strongly disagree' with the value of 1.

Table 3.4

Items for Perceived Ease of Use

Code	Items
PEOU1	Learning to use ICT for self-paced learning is easy for me.
PEOU2	I find it easy to obtain materials using ICT for my studies.
PEOU3	My interaction with ICT is clear for self-paced learning.
PEOU4	My interaction with ICT is understandable for self-paced learning.
PEOU5	It is easy for me to become skilful at using ICT for self-paced learning.
PEOU6	Overall, I find that ICT is easy to use for my self-paced learning.

3.6.2.3 Attitude towards using ICT

The attitude scale consists of six instruments that was used to measure students' attitude towards ICT use for self-paced learning. The scale was modified for the purpose of this study. Permission was sought from Albirini (2006) as the person who developed the scale. The Cronbach's alpha reliability coefficients for the original scale was 0.90. After modification of the original scale and selection of the most relevant scale, another extra two items (A2 and A4) were created by the researcher to meet the purpose of this study. Each item in this attitude towards ICT use was scaled using a five-point Likert scale. Participates were required to tick the most appropriate scale of strongly disagree to strongly agree in relation with their attitude towards ICT use for self-paced learning. Each scale was assigned with a score as follows: 5 for 'strongly agree', 4 for 'agree', 3 for 'neutral', 2 for 'disagree', and 1 for 'strongly disagree'. The participant's score in this section indicates their level of favourable attitude quotient towards ICT use for self-paced learning from lowest (1) to highest (5).

Table 3.5

Items for Attitude towards using ICT

Code	Items
A1	ICT is an important source to maintain my interest in achieving my learning goals through self-paced learning.
A2	ICT is an important tool to maintain my interest in achieving my learning goals through self-paced learning.
A3	I feel that using ICT for my self-paced learning is a good idea.
A4	I have a generally favourable attitude towards using ICT for my self-paced learning.
A5	I feel that using ICT makes self-paced learning more interesting.
A6	I feel better using ICT for self-paced learning as it provides better access.

3.6.2.4 Behavioural Intention to Use

Behavioural Intention to use scale was formulated with a study that have close relation with ICT use for learning. The scale was developed to measure the intention of students to use ICT for self-paced learning. Acknowledgement of the paper (Tarhini, Hone, & Liu, 2013) was included in the reference list of this study. The original scale constructed by Tarhini, Hone, and Liu (2013) had Cronbach's alpha reading of 0.87. Each item in the scale used a five-point Likert-scale. As formulated based on this scale, the students are required to rate the statements from strongly disagree to strongly agree to show their readiness to use ICT for self-paced learning in their learning process. If the participants are ready to use ICT as stated by the statement in the questionnaire, they can score the highest value of 5 and fill on the lowest value of 1 if they are not ready at all to utilize ICT for self-paced learning. The items in this scale was assigned with scores as follows: 'strongly agree' with the value of 5, 'agree' with the value of 4, 'neutral' with the value of 3, 'disagree' with the value of 2, and 'strongly disagree' with the value of 1.

Table 3.6

Items for Behavioural Intention to Use

Code	Items
BI1	I have the intention to use ICT for my self-paced learning in near future.
BI2	I predict that I would be using ICT in my self-paced learning in near future.
BI3	I plan to use ICT for my self-paced learning in near future.
BI4	I have the intention to learn more about using ICT for my self-paced learning in near future.

3.6.2.5 Mastery

The purpose of this section was to access undergraduates' mastery level of operating ICT tools for self-paced learning. The items were adapted from Albirini (2006) and the internal consistency of the scaled used was over 0.70. The items were modified to fit in for this study's context and purpose. The researcher has altered the questions from the original context, which focused on computer usage. Total of 12 items is compiled in this section. The participants were asked to score their confidence in using the tools or actions correctly from 'very unconfident' (1), 'not confident' (2), 'unsure (3)', 'confident' (4), and 'very confident' (5). The overall scoring for mastery quotient are categorized into five scoring categories for the research to access the level of ICT usage competence, which are 1 is very poor, 2 is poor, 3 is unsure, 4 is good, and lastly 5 is very good.

Table 3.7

Items for Mastery

Code	Items
Ms1	Basic of operating Personal Computer (using keyboard, mouse and etc)
Ms2	Managing files
Ms3	Using word processor
Ms4	Using spreadsheet processor
Ms5	Creating and designing presentation
Ms6	Internet browsing
Ms7	Searching for information using the internet

Ms8	Downloading files from the internet
Ms9	Using emails
Ms10	Using WBLE
Ms11	Using social media
Ms12	Accessing YouTube

3.6.2.6 Motivation

The aim of this section is to understand the students' motivation to use ICT for self-paced learning. The items in this study was self-developed because there was no standard motivation scale for ICT use for learning. The items in the scale will be rated as follows by the respondents: 'strongly agree' with the value of 5 to indicate highly motivated, 'agree' with the value of 4 which implies that the participants are motivated, 'neutral' with the value of 3 if they are unsure, 'disagree' with the value of 2 for not motivated, and 'strongly disagree' with the value of 1 if they are not motivated at all or zero motivation.

Table 3.8 Items for Motivation

Code	Items
Mo1	I believe ICT can help me continue in reaching my ultimate goals in learning through self-paced learning.
Mo2	I believe that ICT can help me to achieve my learning goals quickly through self-paced learning.
Mo3	I believe that ICT can help me to achieve my learning goals efficiently through self-paced learning.
Mo4	I believe that ICT can help me in search for better learning resources to achieve my learning goals. (E.g. UTAR OPAC, e-journals, e-learning)
Mo5	I believe that ICT can help me in search for better opportunities to achieve my learning goals.
Mo6	The thought of using ICT for self-paced learning is exciting for me.
Mo7	Self-paced learning through ICT motivates me in my tertiary education process.

3.6.2.7 Subjective Norm

This section targets to know the students' subjective norm in using ICT for self-paced learning. A total of six items can be found under this section. The scale for these items are

Likert scale of 1-5. The Likert scale is formulated by using five-interval scale of 'strongly agree' with the value of 5, 'agree' with the value of 4, 'neutral' with the value of 3, 'disagree' with the value of 2, and 'strongly disagree' with the value of 1. The respondents are required to rate each item according to the assigned scores. Scoring the highest (5) shows that the participants agree highly with the statement which shows their level of attachment to their significant others when it comes to decision making and scoring lowest (1) indicates the other side of the quotient. The items were adapted from Venkatesh, Morris, Davis, and Davis (2003) study and the internal consistency reading was over 0.70 as reported in their investigation.

Table 3.9

Items for Subjective Norm

Code	Items
SN1	Lecturers thinks that I should use ICT for my self-paced learning process.
SN2	My peers thinks that I should use ICT for my self-paced learning process.
SN3	My parents thinks I should use ICT for my self-paced learning process.
SN4	Generally, I would do what my lecturer thinks I should.
SN5	Overall, I would do what my peers think I should do.
SN6	Essentially, I would do what my parents think I should do.

3.6.3 Section C

All seven items covered in this section is in relation with ICT usage. These items focused on the usage of ICT during students learning process for self-paced learning. The items have an internal consistency reading of over the recommended value of 0.70 and thus were adapted from Albirini (2006) studies. The items found as follows in table 3.10.

Table 3.10

Items for ICT Usage

Code	Items
IU1	I do my assignments using ICT
IU2	I search the internet for information for my assignments
IU3	I email lecturer(s)
IU4	I download, upload or browse learning materials on my university's websites
IU5	I use online dictionaries or encyclopaedia
IU6	I search different sources online for learning a particular topic that I am interested in
IU7	I learn with educational software, games or quizzes

3.7 Validity and Reliability

3.7.1 Validity

McLeod (2013) noted that validity is the range to which a construct measures what it is thought to measure and performs, as it is intended to accomplish. According to Teijlingen and Hundley (2002), researchers can obtain their instruments validation through collecting and analysing data to access accuracy of an instrument so it will hinder the study from any possible technical errors. However, in this study, a panel of experienced experts in education technology field was invited (Appendix 2 – Appendix 3). The panel of experts reviewed the questionnaire for its face validity and content validity as well. Through their constructive feedback, the researcher had made the necessary amendments to the survey questionnaire prior to pilot test.

3.7.2 Reliability

Reliability is considered as an important basis of evidence when forming the validity of the interpretations the researcher makes based on scores from tests and measures (Zumbo, 2007). It is also a measure of uniformity about the degree which the questions are free from random error (Pallant, 2016). In this study, Cronbach's alpha was employed as it remains

the most widely and frequently used reliability index (Sijtsma, 2009; DeVellis, 2012; Hair, Black, Babin, Anderson, & Tathum, 2014). Cronbach alpha reading must be greater than 0.70 or higher to indicate good reliability (Check & Schutt, 2012; Griethuijsen et al., 2014; Faremi, 2016; Taber, 2017). After some reading done on Cronbach alpha, the following rules of thumb Cronbach's Alpha (Table 3.11) coefficients were formulated into a table to serve as a guideline for the researcher.

Table 3.11

Recommended Cronbach Alpha Range

Alpha Range	Decision
Below .60	Unacceptable
Between .60 and .65	Undesirable
Between .65 and .70	Fairly Acceptable
Between .70 and .80	Good
Between .80 and .90	Very Good
Above .90	Should Consider Shortening the Scale

Note. Source: Pallant, 2016; Field, 2013; DeVellis, 2012.

3.7.2.1 Pilot Test

A smaller sample size of participants were used for pilot study in this research. It was done as to serve as a reference for the larger scale research (Gupta & Gupta, 2011). The preliminary version of the survey was established from previous available literature and refined through consultation with several experienced academicians in the field of educational technology.

Through the pilot study, a more organized way can be created for congregation of data that can be utilised for revising (Olsen, 2012). This pilot study was carried out to assess the reliability of the questionnaire and assess the planned data analysis techniques to discover possible problems (Teijlingen & Hundley, 2002). The results obtained were examined using Statistical Package for the Social Sciences (SPSS) statistical software to

show the reliability. Moreover, possible practical problems in the investigation process can be identified during pilot studies for further amendment.

A total of 65 students took part in the pilot study. The researcher distributed 65 questionnaires manually to the undergraduates in two campuses and all (100%) the questionnaires were successfully returned. Out of the 65 copies, only 60 (92%) copies were usable and another five (8%) sets of questionnaires were unusable due to missing data (Figure 3.1).
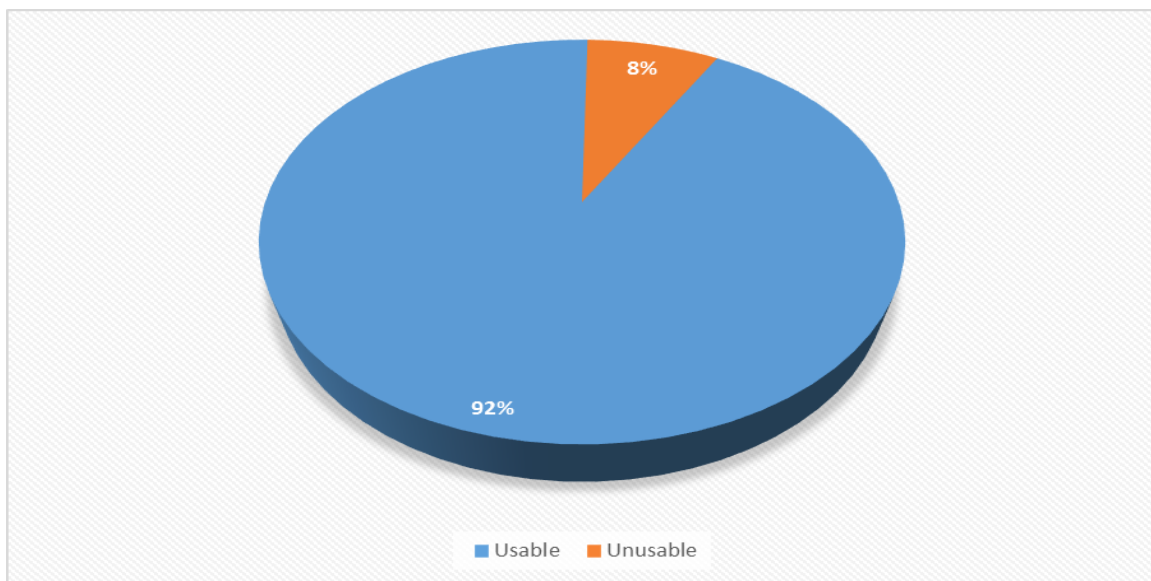
Figure 3.1: Pilot Study Response

Out of the 65 questionnaire, 60 questionnaires were obtained with complete data. Later, the data derived from 60 questionnaires were tested to determine the reliability reading. Feedback were also obtained from the students on the clarity of the items used. Each campus namely, Sg Long Campus and Kampar Campus had 30 undergraduate participants respectively (Table 3.12). The breakdown of participants according to their respective gender are 23 male and 37 female undergraduates (Table 3.12). Thus, majority of the undergraduate participants involved in this study were females (61.7%) compared to male (38.3%). The age of the respondents varied from 19 to 23 years old.

Table 3.12

Distribution of Participants

Respondents' Characteristics	Frequency	Percentage (%)
Campus		
Sg. Long	30	50
Kampar	30	50
Gender		
Male	23	38.3
Female	37	61.7
Age		
19	13	21.7
20	26	43.3
21	8	13.3
22	4	6.7
23	9	15
Total	60	100

Some modifications to the items were made with the approved consent of the respective authors of the questionnaire items. Some of the words, phrases and items were the changes made during the modification process. It was done to make the items applicable and relevant to the study context. This was also done by the researcher to attain a higher Cronbach alpha, which directly lead to a greater reading for internal consistency of the items before administrating it for the actual survey collection. The participants in the pilot study were encouraged by the researcher to provide some opinion upon reading the questionnaire and the items that it contained. The students were also asked to comment on the item clarity to avoid ambiguous statement that might confuse the student's answer for the actual data collection.

The Cronbach alpha coefficient obtained for the pilot study is accessible in Table 3.13. The Cronbach's Alpha coefficient for this pilot study ranges from .763 to .903. As a result, this questionnaire had a very good internal consistency as every alpha level of the

scale was higher than .70 as recommend by DeVellis (2012), Field (2013), and Pallant (2016). The highest alpha coefficient belongs to scale mastery level which is .903. whereas the second strongest alpha coefficient was attitude towards ICT use (.878). The rest of the scale had alpha coefficient ranging from .763 and .869. The scales were perceived usefulness (.872), perceived ease of use (.822), intention to use (.869), motivation (.853), subjective norm (.808), and ICT use (.763). The researcher was satisfied with the overall results of the pilot study which had obtained a reliability of high levels. After the administration of the pilot study, the questionnaire items were used for this study. In the same Table 3.13, the researcher presented the findings of the reliability testing for the actual study's questionnaire items.

Table 3.13

Reliability of the Instrument

Scale	Internal Reliability of Pilot Study (n=60)	Internal Reliability of Actual Study (n=853)
Perceived Usefulness	.872	.864
Perceived Ease of Use	.822	.837
Attitude towards using ICT	.878	.836
Intention to Use	.869	.862
Mastery	.903	.895
Motivation	.853	.825
Subjective Norm	.808	.808
ICT Usage	.763	.794

3.8 Data Collection

3.8.1 Procedures

This study was carried out in two separate campuses of a private university in Peninsular Malaysia, respectively located at Perak and Selangor from July 2016 to December 2016. Nine faculties were involved in the data collection process. The data was collected in a

long trimester and a short trimester which consist of fourteen weeks and seven weeks respectively. The questionnaires were manually distributed to the undergraduate participants within the two campuses. The distribution of questionnaires was mostly done in lecture halls and tutorial rooms with the permission from deans and the respective lecturers. During the survey distribution, the researcher had explained the reason for the research and seek consent from the undergraduates before they answered the questionnaires. Upon agreement of participation voluntarily in the study, the students have signed two forms namely; consent form (Appendix 4) and the personal data protection statement form (Appendix 5), that complies with UTAR research ethics. After the completion of the forms, the respondents took approximately 10 minutes to complete the survey.

3.8.2 Ethical Considerations

Creswell (2014) said that during a research study processes, any ethical issues may arise and a researcher must anticipate the problem. According to Olsen (2012), quantitative researches frequently consist of collecting data from people, thus it is essential to protect the participants who take part in the research. Researchers are advised to protect their participants by mounting trust and safeguarding them against wrongdoing (Creswell, 2014). Olsen (2012) also believed that upholding confidentiality and privacy of the participants at any given time must be the first priority by any researchers involve in a study.

In order to protect the identities of participants, the researcher has adhered to the university's Research Ethics and Code of Conduct and Code of Practice for Research Involving Human. Before the admission of survey to the undergraduates, the researcher

had obtained the approval from the university's Scientific and Ethical Review Committee (Appendix 6).

3.8.3 Data Collection Chronology

For reference of data collection procedures, the researcher drew a chronology (Figure 3.2).

```
┌─────────────────────────────────────────────────────────────────────┐
│    Approval from Respective Authors to Adapt and Modify the Questionnaire │
└─────────────────────────────────────────────────────────────────────┘
                                  │
                                  ▼
┌─────────────────────────────────────────────────────────────────────┐
│       Approval from the UTAR Scientific and Ethical Review Committee    │
└─────────────────────────────────────────────────────────────────────┘
                                  │
                                  ▼
┌─────────────────────────────────────────────────────────────────────┐
│                              Pilot study                               │
└─────────────────────────────────────────────────────────────────────┘
                                  │
                                  ▼
┌─────────────────────────────────────────────────────────────────────┐
│  Approval from the Dean of Faculties to conduct the survey in their respective faculties │
└─────────────────────────────────────────────────────────────────────┘
                                  │
                                  ▼
┌─────────────────────────────────────────────────────────────────────┐
│   Obtain lecturing venue and hours from the assigned lecturers for data collection │
└─────────────────────────────────────────────────────────────────────┘
                                  │
                                  ▼
┌─────────────────────────────────────────────────────────────────────┐
│                     Students fill in the questionnaires                 │
└─────────────────────────────────────────────────────────────────────┘
                                  │
                                  ▼
┌─────────────────────────────────────────────────────────────────────┐
│                         Collection and Data Entry                       │
└─────────────────────────────────────────────────────────────────────┘
```

Figure 3.2. Data Collection Procedures

3.9 Data Analysis

The data analysis for quantitative data was computed using International Business Machines Statistical Package for the Social Science (IBM SPSS) 22.0 and Analysis of Moment Structure (AMOS).

3.9.1 Descriptive Analysis

In this study, data analysis for descriptive analysis was done using SPSS Version 22. The analysis contains the description on demographic information and the amount of time spend by the students using ICT for their self-paced learning purposes. The data is described using descriptive statistics such as frequency, mean, and standard deviation. The average of the total sum was calculated in a set that gives the mean of the construct and thus, an easier interpretation of the findings was done by the researcher.

3.9.2 Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) is a statistical technique which enables a researcher to use it to validify the factor arrangement of a set of observed variables (Brown & Moore, 2015). According to Hair, Black, Babin, Anderson, and Tathum, (2014), CFA model gives a platform for all further theory testing as it measures theory based on the covariance between all measured items. This statistical technique allows the researcher to verify the number of underlying dimensions of the factors tested in this study. According to Brown and Moore (2015), CFA should be used as a predecessor to structural equation models that specify structural relationships. Therefore, CFA was used by the researcher in this study before the SEM approach.

3.9.3 Structural Equation Modelling

SEM is a statistical technique that assist researchers to test their hypothesis regarding relationship among observed and latent variables (Teo, Tsai, & Yang, 2013). Latent variables are denoted as unobserved variables or factor (Teo, Tsai, & Yang, 2013). SEM also allows for modelling multivariate relations and for estimating indirect effects (Chow,

2016). In other words, it is the combination of both independence and dependent technique as a family of models to seek explanation among multiple variables.

Byrne (2010) indicated that SEM is capable of correcting for measurement error. This is because the individual independent factor is portrayed by two parts: the observed variable and an error term. By noting and correcting for measurement error, the causal effects are a more accurate measure of the actual impacts of the population. A simultaneous statistical analysis of the whole system of factors can be tested to define the range which it is consistent to the data obtained. If goodness of fit is formulated, the plausibility of the relations among variables can be argued and possibility of the relationship can be rejected if the fitness is not achieved through SEM.

According to Teo, Tsai, and Yang (2013), SEM takes the confirmatory approach to the analysis of a structural theory having some occurrence, which is determined by the fit between controlled covariance matrix inferred by the hypothesis model and the sample of covariance matrix from the data. A series of structural equations is formulated to show the causal processes in SEM whereby it maps out to a hypothesized theoretical model (Byrne, 2010; Chow, 2016).

The characteristics of SEM aforementioned can be summarized into namely the ability to estimate the various and interrelated dependence relationships, the ability to represent the latent variables in the relationship and explain measurement error in the estimation process, and the capability to define a model that explain the relationship (Hair, Black, Babin, Anderson, & Tathum, 2014). Feature of SEM set it apart from other multivariate technique (Hair, Black, Babin, Anderson, & Tathum, 2014). Hence, the research decided that SEM is the best technique to test the study hypothesis.

The six stages of SEM was carried out in this study to test the proposed model as this research study have looked into a variety of variables that can maximize the use ICT for self-paced learning among undergraduates. The stages include defining individual construct, generating and stipulating the complete measurement model, formulating a study to generate empirical result, evaluating the measurement model validity, specifying the structural model, and accessing the structural validity.

In this study, AMOS was used by the researcher to analyze the data. The goal of this study was to create a structural model of undergraduates' actual use of ICT and explain the interrelationships between factors in maximizing ICT usage for self-paced learning.

3.9.3.1 Structural Equation Modelling Criteria

Before carrying out SEM, which is a multivariate data analysis and second-generation analysis method after SPSS, several criteria were implemented on the obtained data to qualify the data for analysis using SEM. The criteria were known as outliers, multicollinearity, and normality (Hair, Black, Babin, Anderson, & Tathum, 2014). Outliers are the observations, which take on values that are very different from the rest of the data set (Hair, Black, Babin, Anderson, & Tathum, 2014; Blunch, 2016). As for this study, multivariate outliers were identified using Mahalanobis squared distance D^2 (Tabachnick & Fidell, 2014; Blunch, 2016; Kline, 2016). Besides that, Hair, Black, Babin, Anderson, and Tathum (2014) explained that multicollinearity is the high correlation between two independent variables and could misleadingly inflate the value of standard errors that can make some constructs statistically insignificant when they should be. The value of detection-tolerance (TOL) and the variance inflation factor (VIF) was used in this study to identify multicollinearity with cut-off point reference to Pallant (2016) and Hair, Black, Babin, Anderson, and Tathum, (2014) of .10 for TOL and for its inverse, VIF value should

be lesser than ten. Normality of the data was accessed in this study based on the skewness and kurtosis approach. As in in this study, the value of skeweness and kurtosis followed the suggestion of Hair, Black, Babin, Anderson, and Tathum, (2014) which claimed that the acceptable critical values are ±2.58 and ±1.96, corresponding to .05 error level. In addition, various method such as normal Q-Q plot, normal detrended Q-Q plot, histogram, and histogram was used to further clarify normality.

3.10 Chapter Summary

Research design and description of quantitative method was explained and provided in this chapter. The questionnaire for this investigation was designed to assist the researcher in defining the factor that leads to the use of ICT for self-paced learning among undergraduates. Before the actual administrating of the questionnaires, the questionnaire was modified and a pilot study was conducted. The sampling procedures were also discussed in this chapter. The data collection procedures was explained. The ethical issue relating to the respondents were also discussed and lastly, the explanation of data analysis was given. The subsequent chapter presents the results of the statistical tests obtained from data analysis.

CHAPTER 4

RESEARCH RESULTS AND FINDINGS

4.1 Introduction

The chapter illustrates the findings of this study. The outline of the results of the data analysis are presented to answer the objectives of this investigation. The primary objective of the study was to ascertain the factors that maximize the undergraduate students' use of ICT for self-paced learning. The factors were perceived ease of use, perceived usefulness, and attitude towards using ICT, behavioural intention to use ICT, mastery, motivation, and subjective norm.

The findings of this study are presented in the following orders: (a) preliminary examination of data; (b) undergraduate students' demographic information; (c) CFA; (d) SEM. The first section of the study presents the preliminary examination of data and followed by the general description of the respondents. The subsequent sections present the findings in line with the objective of the study, which is to extend the existing TAM model with factors that influence the use of ICT for self-paced learning among undergraduates.

4.2 Preliminary Examination of Data

This section of the study presents the preliminary data analysis namely the analysis of missing data and to examine the criteria for SEM such as outliers, multicollinearity, and normality. According to Hair, Black, Babin, Anderson, and Tathum, (2014), an organised research data is much needed for a quality presentation of findings and to achieve a form of appropriateness and fitness for further analysis in a research study. Therefore,

preliminary examination of data was performed before moving to hypothesis testing. The following subsection discuss the outcomes of the preliminary data analysis conducted.

4.2.1 Missing Data

Missing data might occur when a particular respondent failed to respond to one or more questions in a questionnaire. This is regarded as an important scenario to take notice in a research as missing data can significantly influence the results of statistical analyses. If missing data is identified in the dataset while conducting SEM, the estimation process that is based on maximum likelihood, cannot be done (Hair, Black, Babin, Anderson, & Tathum, 2014). In a multivariate data, missing data is viewed as a critical problem that needs the researcher's attention to eliminate them from the analysis.

Hence, the researcher typed data entry in manually after the complete collection of the survey form. As the researcher completed the data entry process, the researcher identified and managed the missing data by screening the data using frequency distributions and descriptive statistics using SPSS statistical software. This was done to ensure there were no missing data due to human error during the data entry process. As a result, the SPSS test indicated that there was no occurrence of missing data in the data set produced for the study. The aforementioned scenario is plausible as the researcher personally administered the questionnaires to the respondents and checked thoroughly to detected survey forms with missing value and excluded them at the initial stage as a precaution step before data entry.

4.2.2 Outliers

Outliers are the observations which take on values that are very different from the rest of the data set (Hair, Black, Babin, Anderson, & Tathum, 2014; Blunch, 2016). According to Hair, Black, Babin, Anderson, and Tathum, (2014), outliers are one of the fundamental issues that needs to be sorted out before testing a structural model as it may cause problems related to SEM estimation (Blunch, 2016). Conversely, Pallant (2016) said it was common to find outlaying residues in a large sample and the outlaying residues may not be necessary needed to be take action upon. The researcher can either retain or remove the residues or outliers once they are detected (Pallant, 2016; Hair, Black, Babin, Anderson, & Tathum, 2014). Based on the recommendation and fact put forth by Hair, Black, Babin, Anderson, and Tathum, (2014) and Pallant (2016), extreme outliers marked with asterisk (*) were detected and removed while running the analysis to avoid possible arising problem during the SEM estimation. As a result, a total of 10 extreme outliers were detected in a sample size of 900. Five extreme outliers belonging to perceived usefulness, three extreme outliers from attitude, and mastery containing two extreme outliers (Appendix 12).

Outliers can be detected using Mahalanobis squared distance D^2 (Tabachnick & Fidell, 2014; Blunch, 2016; Kline, 2016). The study uses .001 as the threshold value or the conservative value of significance as suggested by Hair, Black, Babin, Anderson, and Tathum, (2014); Tabachnick and Fidell (2014), and Kline (2016). On the other hand, the critical value used to inspect the multivariate outliers in this study was 16.27. Therefore, upon analysing, the Mahalanobis squared distance output by the researcher, 37 outlying cases were found to exceed the critical value and as suggested by Hair, Black, Babin, Anderson, and Tathum, (2014) and Tabachnick and Fidell (2014), the outlying cases were

removed. Subsequently, after the removal of extreme outliers and multivariate outliers, only 853 sample is available for further analysis.

A total of 900 questionnaires where finalised after screening and eliminating for incomplete data. After conducting the preliminary round which the researcher eliminated the outliers, the finalised number of samples obtained for this study was 853 samples. The exact number of target population in this study is 20,274. Therefore, the researcher used Isreal (1992) target population's table to come up with the minimum required number of participates for population of 20,274, which it should be 392 participants. As a result, the number of participating undergraduates (n=853) were deemed adequate for this study.

4.2.3 Normality

In the Test of Normality (Appendix 8), the value of the Kolmogorov-Smirnov and Shapiri-Wilk statistic were given. According to Pallant (2016), if the non-significant value is more than .05, it is considered normal. It was found that the distribution of the mean for all the variable in this study is not normal as the *p*-value for each of the variables are less than .05. However, Pallant (2016) believed that the value is common in a large sample size.

To further clarify normality in this study, various addition method such as normal Q-Q plot, normal detrended Q-Q plot, and histogram was used. Through the visual inspection, the mean distribution of the variables did not deviate from the normal data distribution. Normality of the data was also accessed in this study based on the skewness and kurtosis approach. Skewness explains the shape of the data distribution whereas kurtosis is a statistical measurement of the peakedness (Hair, Black, Babin, Anderson, & Tathum, 2014; Tabachnick & Fidell, 2014; Pallant, 2016;) and flatness of the distribution (Hair, Black, Babin, Anderson, & Tathum, 2014; Kline, 2016). According to Kline (2016), Hair et al. (2014) and Pallant (2016), if the tail of the distribution was longer on the right

side of the normal curve is considered positively skewed and negatively skewed if the distribution was longer on the left side. As for the present study, the researcher used SPSS statistical software to obtain the value of skeweness and kurtosis, and followed the suggestion of Hair, Black, Babin, Anderson, and Tathum, (2014), the acceptable critical values are ± 2.58 and ± 1.96, corresponding to .05 error level. The value of skewness and kurtosis for each of the variables falls between the range of ± 2.58 and ± 1.96, thus, these values are deemed acceptable. As a result, the normality assumption was met for the distribution of the mean for each of the variables.

Table 4.1

Descriptive Statistics for Normality

Scale	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
PU	2.00	5.00	3.87	0.51	0.10	0.05
PEOU	2.00	5.00	3.69	0.54	0.11	-0.02
A	2.17	5.00	3.79	0.52	0.13	0.07
BI	1.75	5.00	3.93	0.61	-0.12	-0.08
Ms	2.50	5.00	4.10	0.49	-0.27	-0.06
Mo	2.43	5.00	3.80	0.50	0.14	-0.14
SN	1.50	5.00	3.41	0.57	0.13	0.43
IU	1.43	5.00	3.78	0.63	-0.38	0.14

Note. The acceptable critical values are ± 2.58 and ± 1.96, corresponding to .05 error level

4.2.4 Multicollinearity

According to Pallant (2016), before running a correlation analysis, it is the best to generate a scatterplot to explore the relationship between two variables. Tabachnick and Fidell (2014) further claimed that if the scatterplot is oval-shaped, the variables are linearly related and for a non-linear relationship, a curvilinear relationship will be evident. Once the scatter plot was generated, the researcher found that the scatterplot for the variables are in a linear relationship as there were no residue of curvilinear relationship found (Appendix 9). Thus, the data is ready to be analysed in for multicollinearity.

It is important that no multicollinearity issues occur among the constructs in a multivariate analysis. Therefore, before modelling and executing the structural model, the researcher needs to validate that all constructs involved in the model are not highly correlated and discriminant of each other especially between the exogenous constructs (Awang ; 2012b; 2014; 2015; Awang, Afthanorhan, & Asri, 2015; Awang, Afthanorhan, Mohamed, & Asri, 2015; Kashif, Awang, Walsh, & Altaf, 2015; Kashif, Samsi, Awang, & Mohamed, 2016). If the two independent constructs are greatly interrelated (correlation greater than 0.85), then there occurs a problematic situation called multicollinearity. Hair, Black, Babin, Anderson, and Tathum, (2014) explained further that multicollinearity is the high correlation between two independent variables. According to Pallant (2016), multicollinearity can be detected through Pearson's correlation coefficient. If the coefficient value is greater than .90, high collinearity is established (Pallant, 2016; Hair, Black, Babin, Anderson, & Tathum, 2014;). Based on the output of the analysis depicted in Table 4.2, all the values are found to be lower that the cut-off points of .90.

Table 4.2

Pearson's Correlations between the Constructs

Constructs	PU	PEOU	A	BI	Mo	Ms	SN	IU
PU	1.00							
PEOU	.644	1.00						
A	.611	.654	1.00					
BI	.541	.546	.622	1.00				
Mo	.613	.600	.679	.583	1.00			
Ms	.326	.384	.404	.392	.369	1.00		
SN	.320	.344	.367	.344	.428	.228	1.00	
IU	.290	.267	.269	.302	.314	.365	.164	1.00

PU: Perceived Usefulness; PEOU: Perceived Ease of Use; A: Attitude towards using ICT; BI: Behavioural Intention to Use ICT; Mo: Motivation; Ms: Mastery; SN: Subjective Norm; IU: ICT Usage. $*p < .05$

Further multicollinearity identification can be done based on the most common measures, which are the value of TOL and VIF. Thus, it was applied with cut-off point reference to Hair, Black, Babin, Anderson, and Tathum, (2014) and Pallant (2016) of .10

and more for TOL and VIF value should be lesser than ten. Based on the value presented

in Table 4.3, the TOL values were above the value of .10 and VIF values were found to be

less than ten as well. Therefore, there were no high bivariate correlation values detected

among the variables in the study data.

Table 4.3

Collinearity Statistics

Constructs	Tolerance	Variance Inflation Factor (VIF)
PU	.476	2.090
PEOU	.451	2.218
A	.393	2.541
BI	.525	1.903
Ms	.786	1.273
Mo	.427	2.342
SN	.795	1.258

Dependent Variable: IU;
IU: ICT Usage; PU: Perceived Usefulness; PEOU: Perceived Ease of Use; A: Attitude towards using ICT; BI: Behavioural Intention to Use ICT; Mo: Motivation; Ms: Mastery; SN: Subjective Norm

4.3 Respondents' Profile

After the preliminary examination of the study data, this section will present the profiles

of the remaining undergraduate students (n=853), including the general demographic

characteristics, namely, gender, age, and faculty. Other that these information,

confirmation of ICT usage for self-paced learning and hours of ICT usage for self-paced

learning among the undergraduate students were presented as well.

4.3.1 Respondents' Demographic Characteristics

Respondents participated in this study were 344 male and 509 female undergraduates

(Table 4.4). Thus, majority of females (59.7%) participated compared to males (40.3%)

who participated in this research study.

Table 4.4

Distributions of Respondents by Gender

Gender	Frequency	Percentage (%)
Male	344	40.3
Female	509	59.7
Total	853	100

The age of the respondents varied from 19 to 24 years old. Table 4.5 shows the summary of the undergraduates' age. The mean age of the participants is 20.43 with a standard deviation of 1.28.

Table 4.5

Distributions of Respondents by Age

Age	Frequency	Percentage (%)
19	244	28.6
20	257	30.1
21	180	21.1
22	96	11.3
23	66	7.7
24	10	1.2

Table 4.6 presents the distribution of respondents by faculty. Based on the figures in Table 4.6, undergraduates from Faculty of Medicine and Health Sciences and Faculty of Information and Communication Technology each had the same amount of 100 respondents of the total 853 participants (11.7%) participating in the survey. Respondents participated from Faculty of Engineering, Green Technology was 96 undergraduates, and Lee Kong Chian Faculty of Engineering and Sciences had the same amount of respondents (96) participating in the survey as well, while 95 students from Faculty of Science took part in the survey. Table 4.6 also depicts that the reported number of respondents from Faculty of Creative Industries was 95 students. On the other hand, Faculty of Accountancy and Management located in Sungai Long Campus had a participation of 94 undergraduates.

A total of 10.7% of participants (91) in this study hails from Faculty of Business and Finance whereas Faculty of Arts and Social Sciences had the lowest value of participants (86) which contributed to 10.1% of the study sample.

Table 4.6

Distribution of Respondents by Faculty

Faculty	Frequency	Percentage (%)
Faculty of Science	95	11.1
Faculty of Creative Industries	95	11.1
Faculty of Business and Finance	91	10.7
Faculty of Arts and Social Sciences	86	10.1
Faculty of Medicine and Health Sciences	100	11.7
Faculty of Accountancy and Management	94	11.0
Faculty of Engineering and Green Technology	96	11.3
Lee Kong Chian Faculty of Engineering and Sciences	96	11.3
Faculty of Information and Communication Technology	100	11.7

Table 4.7 presents the amount of time undergraduates used the ICT for self-paced learning on a weekly basis. A majority of undergraduates (49.6%) used ICT more than 30 minutes to two hours on a weekly basis for self-paced learning. In this study, all the 853 respondents have used ICT for self-paced learning and 68 participants were excluded from the study in the early stage of preliminary analysis as they have reported that they have not used ICT for self-paced learning based on question number five in the questionnaire (Appendix 1).

Table 4.7

Distributions of Respondents by ICT Usage Time

ICT Usage Time	Frequency	Percentage (%)
>30 minutes < 2 hours	423	49.6
>2 hours < 4 hours	221	25.9
>4 hours < 6 hours	102	12.0
>6 hours	107	12.0

4.4 Structural Equation Modeling

Through SEM, the six stages (Hair, Black, Babin, Anderson, & Tathum, 2014) were conducted to test and assess the theory for model fit from the obtained data: (1) Defining the individual constructs; (2) Developing and specifying the measurement model; (3) Designing study to produce empirical results; (4) Assessing measurement model validity;(5) Specifying the structural model; (6) Assessing the structural model's validity.

As this study used SEM to analysis the data, a similar study conducted in Malaysian education context by Moses (2012) was used as a guide and reference for this study to carry out the analysis step-by-step and the researcher has also referred to Awang (2015) style of reporting.

4.4.1 The Influence of Factors on the Model Measuring the Use of Information and Communication Technology (ICT) for Self-Paced Learning among Undergraduates.

The first objective of the study was to extend the TAM to test the model overall fit between the extended model, which is the proposed research model in this study and the obtained data of the factors on ICT use for self-paced learning. The proposed model tested was the conceptual framework model (Figure 2).

4.4.1.1 Defining the Individual Constructs (Stage 1)

As the aim of the study was to investigate on the factors influencing the use of ICT for self-paced learning among the undergraduates. Hence, based on the TAM model and literature review, seven factors were identified as the key constructs that may influence the undergraduates in using ICT. The factors were perceived ease of use, perceived usefulness, attitude, behavioural intention, motivation, mastery, and subjective norm.

4.4.1.2 Developing the overall Measurement Model (Stage 2)

A measurement model was produced and tested by the researcher. In this study, there were eight latent variables and 55 items that was measures based on the developed questionnaire. The visual diagram depicts the overall measurement model of the latent variables in this study (Figure 4.1). The pooled construct measurement model using the Analysis of Moment Structures (AMOS) for Confirmatory Factor Analysis (CFA)are presented later in this chapter. These measurement models are hypothesized as reflective as the path of causality are from the latent variables to the indicators. Moreover, each construct contains more than three indicators as suggested by thee three-indicator rule of thumb. The number of indicators ranges from four to 12 per variable. Hence, the degree of freedom will be greater than the paths to be estimated.
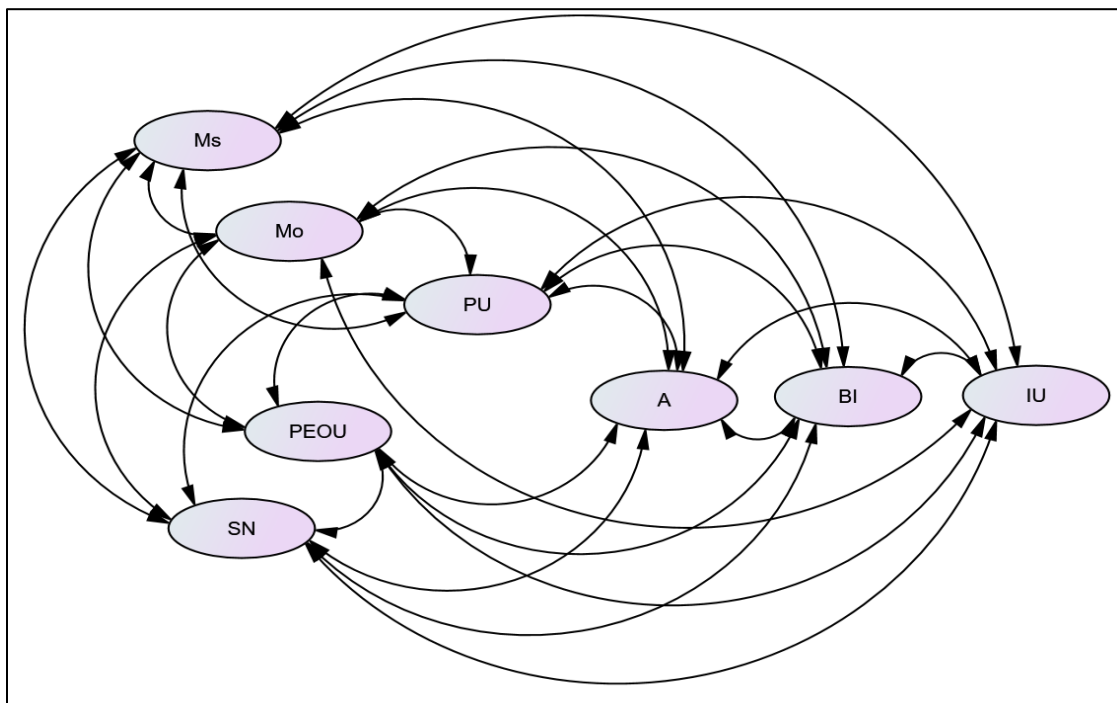
Ms: Mastery, Mo: Motivation, SN: Subjective Norm, PU: Perceived Usefulness, PEOU: Perceived Ease of Use, A: Attitude towards Using ICT, BI: Behavioural Intention to use ICT, IU: Actual ICT Use.

Figure 4.1. Overall Measurement Model

4.4.1.3 Designing a Study to produce Empirical Results (Stage 3)

After conducting the initial analysis on the raw data acquired from the survey forms, the researcher have identified and removed outliers and there was no major problem detected for missing data. The final sample size was 853, which was found to be sufficient for this study.

4.4.1.4 Assessing Measurement Model Validity (Stage 4)

According to Awang (2012, 2014, & 2015), Bakar and Afthanorhan, (2016), and Hoque and Awang, (2016), the measurement model of latent constructs needs to achieve three types of validity which are Construct Validity, Convergent Validity, and Discriminat Validity. The Construct Validity is evaluated through the Fitness Indexes of the Measurement Model, the Convergent Validity is calculated using the Average Variance Extracted (AVE), and Discriminant Validity is evaluated by creating the Discriminant Validity Index Summary. As for the reliability, it is adequate for the study to measure the Composite Reliability (CR) since it replaces the traditional value of Cronbach Alpha for analysis using SEM (Kashif, Awang, Walsh, & Altaf, 2015; Noor, Aziz, Mostapa, & Awang, 2015; Kashif, Samsi, Awang, & Mohamed, 2016).

The underlying factor is considered effective if its fitness indexes reached the three model fit categories which are Absolute Fit, Incremental Fit and Parsimonious Fit (Awang, 2012; 2014; 2015). The level of acceptance and its respective index are specified in the following table (Table 4.8).

Table 4.8

The Three Categories of Model Fit and Their Level of Acceptance

Name of Category	Name of index	Level of Acceptance
Absolute Fit Index	RMSEA	RMSEA < 0.08
	GFI	GFI > 0.90
Incremental Fit Index	CFI	CFI > 0.90
	TLI	TLI > 0.90
Parsimonious Fit Index	Chisq/df	Chi-Square/ df < 5.0

Note. The indexes are recommended since they are frequently reported in literatures
Source: Awang, (2012b); Awang (2015)

4.4.1.4.1 Mastery

There were 12 items measuring mastery in ICT usage for self-paced learning among undergraduates. Table 4.9 depicts on the mastery of undergraduates in using ICT for self-paced learning. Item Ms12 "Accessing YouTube" scored the highest mean (4.43) with a standard deviation of 0.63. Whereas, item Ms4 "Using spreadsheet processor" scored lowest mean with a value of 3.48 (S.D. = 0.83).

The inter-item correlation matrix is shown in Table 4.10. The maximum correlation of an item with at least one of the item was .30 > r < .90. Hence, all the items in the construct correlated adequately.

Table 4.9

Descriptive Statistics for Mastery

Code	Item	M	S.D.
Ms1	Basic of operating Personal Computer (using keyboard, mouse, etc.)	4.23	0.70
Ms2	Managing files	4.07	0.73
Ms3	Using word processor	3.92	0.73
Ms4	Using spreadsheet processor	3.48	0.83
Ms5	Creating and designing presentation	3.75	0.83
Ms6	Internet browsing	4.24	0.68
Ms7	Searching for information using the internet	4.23	0.68

	Ms8	Downloading files from the internet								4.19	0.72
	Ms9	Using emails								4.12	0.73
	Ms10	Using WBLE								4.26	0.67
	Ms11	Using social media								4.31	0.67
	Ms12	Accessing YouTube								4.43	0.63

Table 4.10

Inter-item Correlation for Items in Mastery

	Ms1	Ms2	Ms3	Ms4	Ms5	Ms6	Ms7	Ms8	Ms9	Ms10	Ms11	Ms12
Ms1	1.00											
Ms2	.68	1.00										
Ms3	.60	.68	1.00									
Ms4	.35	.42	.54	1.00								
Ms5	.37	.43	.47	.45	1.00							
Ms6	.53	.53	.48	.24	.34	1.00						
Ms7	.48	.47	.41	.25	.32	.67	1.00					
Ms8	.50	.48	.42	.26	.28	.57	.58	1.00				
Ms9	.39	.39	.38	.25	.30	.45	.45	.48	1.00			
Ms10	.35	.35	.31	.18	.23	.41	.41	.43	.57	1.00		
Ms11	.44	.42	.37	.16	.27	.48	.46	.50	.48	.51	1.00	
Ms12	.44	.42	.33	.10	.24	.52	.50	.53	.44	.51	.72	1.00
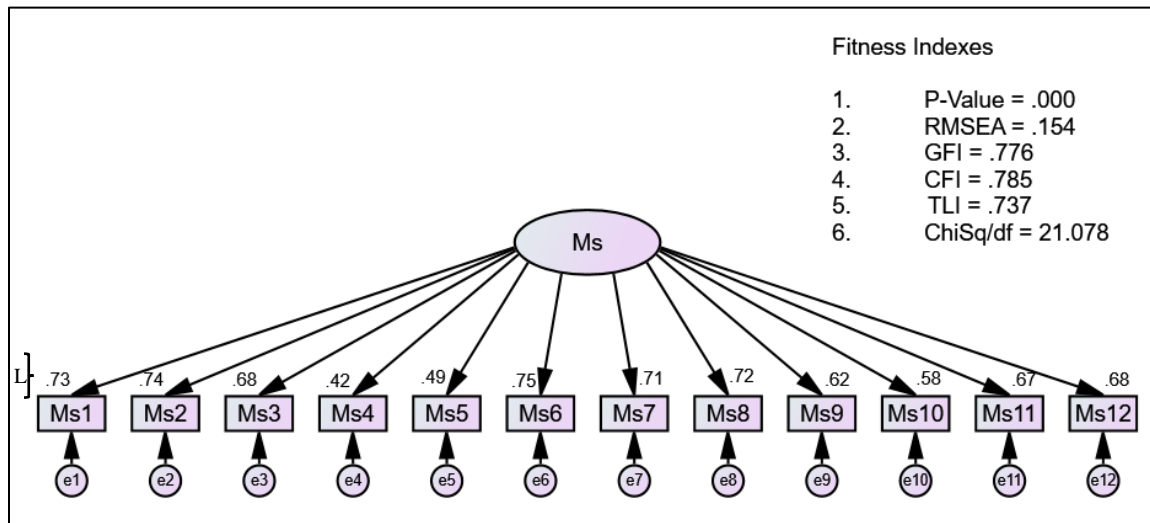
Ms: Mastery; Ms1- Ms 12: Items
L: Factor Loading
e: Error Variance

Figure 4.2. The Initial Measurement Model of Mastery

However, the intial measurement model (Figure 4.2) offers a poor fit (Chi square/df > 5, GFI, TLI < .9, RMSEA > .08). Since the tested model was not valid, the researcher did the process of improving the model by removing several items due to low factor loading.

Five items were dropped from the initial model due to low factor loading, namely Ms4, Ms5, Ms9, Ms10, and Ms11. The error variances were also stabilised (e1 and e2, e1 and e3, e2 and e3, e6 and e8). The revised measurement model for mastery with remaining seven items is shown in Figure 4.3. The AVE measure was 50% and CR exceeded .60 (.86), suggesting adequate reliability. Hence, all the items were significant as required by convergent validity. Furthermore, the revised model is considered has passed all the criterion values (Chi square/df < 5, GFI, TLI, CFI > .9, RMSEA < .08) and shown a better fit with the data obtained.
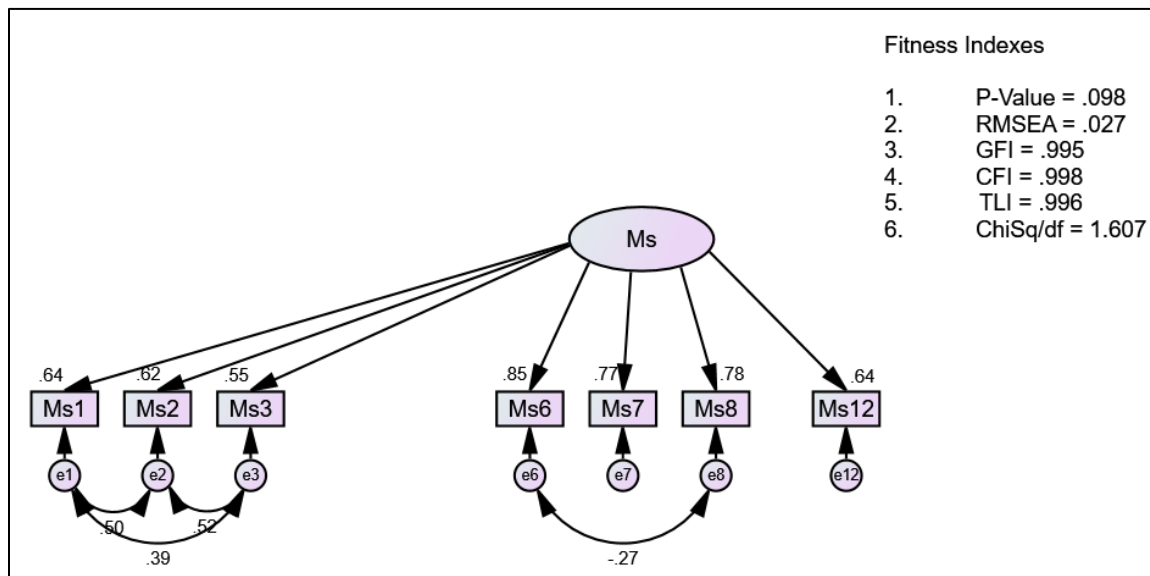
Figure 4.3. The Revised Measurement Model of Mastery

4.4.1.4.2 Motivation

There were seven items measuring motivation in ICT usage for self-paced learning among undergraduates. Table 4.11 depicts on the motivation of undergraduates in using ICT for self-paced learning. Item Mo4 "I believe that ICT can help me in search for better learning resources to achieve my learning goals (e.g. UTAR OPAC, e-journals, e-learning)" scored the highest mean (3.94) with a standard deviation of 0.73. Whereas, item Mo6 "The thought of using ICT for self-paced learning is exciting for me" scored lowest mean with a value of 3.62 (S.D. = 0.75).

Table 4.11

Descriptive Statistics for Motivation

Code	Item	M	S.D.
Mo1	I believe ICT can help me continue in reaching my ultimate goals in learning through self-paced learning.	3.79	0.70
Mo2	I believe that ICT can help me to achieve my learning goals quickly through self-paced learning.	3.83	0.69
Mo3	I believe that ICT can help me to achieve my learning goals efficiently through self-paced learning.	3.83	0.68
Mo4	I believe that ICT can help me in search for better learning resources to achieve my learning goals (e.g. UTAR OPAC, e-journals, e-learning)	3.94	0.73
Mo5	I believe ICT can help me to search for more opportunities to achieve my learning goals.	3.89	0.68
Mo6	The thought of using ICT for self-paced learning is exciting for me.	3.62	0.75
Mo7	Self-paced learning through ICT motivates me in my tertiary education process.	3.70	0.74

The inter-item correlation matrix is shown in Table 4.12. The maximum correlation of an item with at least one of the item was .30 > r < .90. Thus, all of the items correlated sufficiently.

Table 4.12

The Inter-Item Correction for Items in Motivation

	Mo1	Mo2	Mo3	Mo4	Mo5	Mo6	Mo7
Mo1	1.00						
Mo2	.52	1.00					
Mo3	.54	.61	1.00				
Mo4	.35	.37	.36	1.00			
Mo5	.39	.38	.38	.50	1.00		
Mo6	.36	.35	.34	.24	.37	1.00	
Mo7	.35	.36	.34	.33	.46	.56	1.00

However, the initial measurement model (Figure 4.2) offers a poor fit (Chi square/df > 5, GFI, TLI < .9, RMSEA > .08). Since the tested model was not valid, the researcher did the process of improving the model by removing several items due to low factor loading.
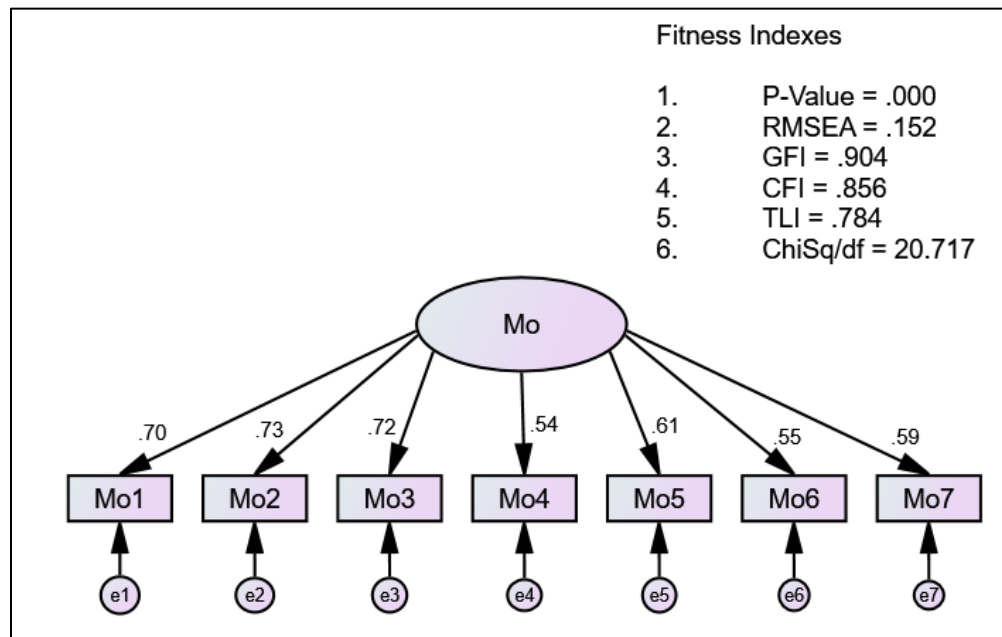
Figure 4.4. The Initial Measurement Model of Motivation

Three items were dropped from the initial model due to low factor loading, namely Mo4, Mo6, and Mo7. The revised measurement model for motivation with remaining four items is shown in Figure 4.5. The AVE measure reported was 50% and it complies with

the suggested value and CR exceeded .60 (.79), suggesting adequate reliability. Hence, all the items were significant as required by convergent validity. As a result, the revised model is considered has passed all the criterion values (Chi square/df < 5, GFI, TLI, CFI > .9, RMSEA < .08) and shown a better fit with the data obtained.


Fitness Indexes

1.	P-Value = .182
2.	RMSEA = .029
3.	GFI = .998
4.	CFI = .999
5.	TLI = .996
6.	ChiSq/df = 1.702
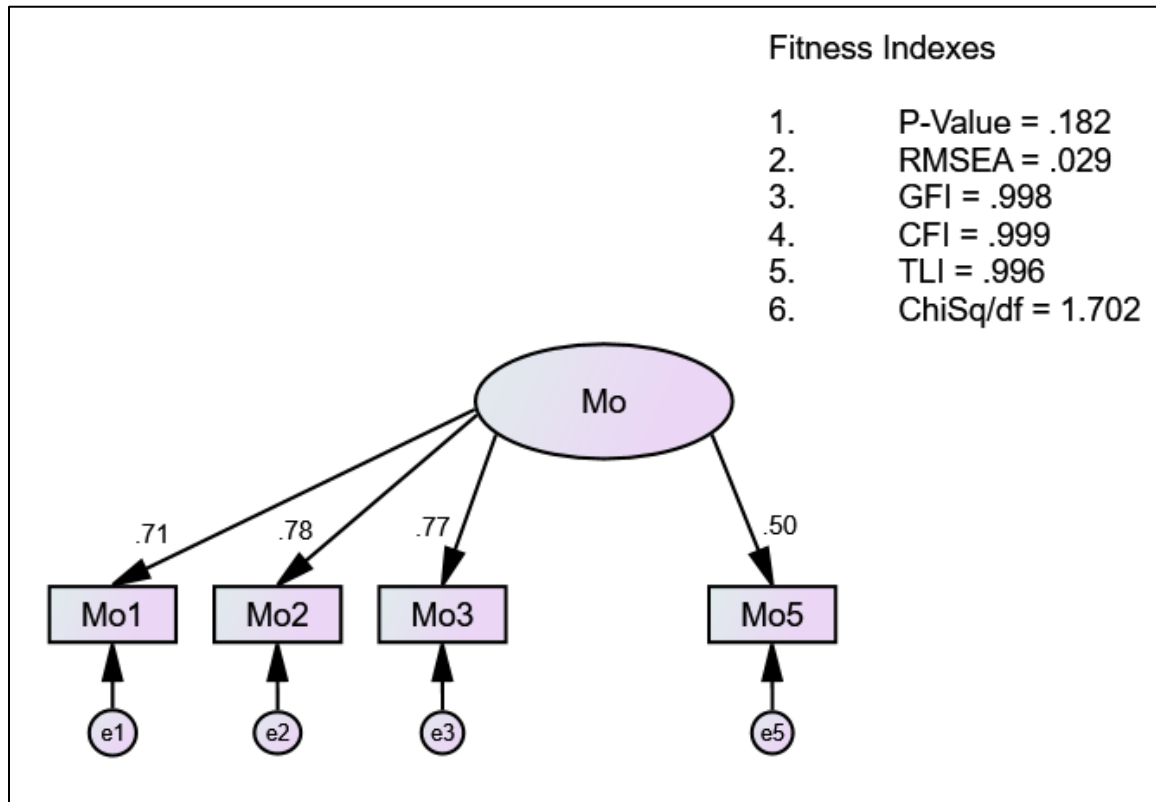
Figure 4.5. The Revised Measurement Model of Motivation

4.4.1.4.3 Subjective Norm

There were six items measuring subjective norm. Table 4.13 depicts on the subjective norm influence of undergraduates in utilizing ICT for self-paced learning. Item SN1 "Lecturers think that I should use ICT for my self-paced learning process" scored the highest mean (3.54) with a standard deviation of 0.77. Whereas, item SN5 "I would do what my peers think I should do" scored lowest mean with a value of 3.25 (S.D. = 0.79).

Table 4.13

Descriptive Statistics for Subjective Norm

Code	Item	M	S.D.
SN1	Lecturers think that I should use ICT for my self-paced learning process.	3.54	0.77
SN2	My peers think that I should use ICT for my self-paced learning process.	3.53	0.74
SN3	My parents think I should use ICT for my self-paced learning process.	3.42	0.82
SN4	I would do what my lecturer thinks I should do.	3.31	0.84
SN5	I would do what my peers think I should do.	3.25	0.79
SN6	I would do what my parents think I should do.	3.42	0.83

The inter-item correlation matrix is shown in Table 4.14. The maximum correlation of an item with at least one of the item was $.30 > r < .90$. Hence, all of the items in the construct was found adequately correlated.

Table 4.14

Inter-item Correlation for Items in Subjective Norm

	SN1	SN2	SN3	SN4	SN5	SN6
SN1	1.00					
SN2	.60	1.00				
SN3	.40	.48	1.00			
SN4	.38	.35	.30	1.00		
SN5	.29	.35	.30	.67	1.00	
SN6	.25	.31	.33	.61	.59	1.00

However, the initial measurement model (Figure 4.6) offers a poor fit (Chi square/df > 5, GFI, TLI < .9, RMSEA > .08). Since the tested model was not valid, the researcher did the process of improving the model by removing several items due to low factor loading.

Figure 4.6. The Initial Measurement Model of Subjective Norm

Two items were dropped from the initial model due to low factor loading, namely SN1 and SN3. The revised measurement model for motivation with remaining four items is shown in Figure 4.7. The AVE measure exceeded 50% (51%) and CR exceeded .60 (.80), suggesting adequate reliability. Hence, all the items were significant as required by convergent validity.

Figure 4.7. The Revised Measurement Model of Subjective Norm

As a result, the revised model is considered has passed all the criterion values (Chi square/df < 5, GFI, TLI, CFI > .9, RMSEA < .08) and shown a better fit with the data obtained.

4.4.1.4.4 Perceived Usefulness

There were seven items measuring perceived usefulness of ICT for self-paced learning. Table 4.15 depicts on the perceived usefulness of utilizing ICT for self-paced learning among the undergraduates. Item PU1 "I would find ICT useful in my self-paced learning process" scored the highest mean (4.04) with a standard deviation of 0.68. Whereas, item PU4 "ICT gives me a greater control over my self-paced learning" scored lowest mean with a value of 3.49 (S.D. = 0.76).

Table 4.15

Descriptive Statistics for Perceived Usefulness

Code	Item	M	S.D.
PU1	I would find ICT useful in my self-paced learning process.	4.04	0.68
PU2	The use of ICT enables me to increase productivity in self-paced learning.	3.93	0.68
PU3	Using ICT improves my study performances.	3.80	0.70
PU4	ICT gives me a greater control over my self-paced learning.	3.49	0.76
PU5	I find ICT a useful tool for my self-paced learning in my course of study.	3.93	0.68
PU6	Using ICT enhances the effectiveness of my self-paced learning process.	3.84	0.68
PU7	Overall, I find ICT to be advantageous for my self-paced learning.	3.96	0.67

The inter-item correlation matrix is shown in Table 4.16. The maximum correlation of an item with at least one of the item was $.30 > r < .90$. Thus, all the items in the construct were found to have correlated adequately.

Table 4.16

Inter-item Correlation for Items in Perceived Usefulness

	PU1	PU2	PU3	PU4	PU5	PU6	PU7
PU1	1.00						
PU2	.64	1.00					
PU3	.49	.53	1.00				
PU4	.33	.34	.46	1.00			
PU5	.46	.47	.44	.42	1.00		
PU6	.44	.50	.46	.43	.57	1.00	
PU7	.53	.49	.50	.41	.55	.62	1.00

However, the initial measurement model (Figure 4.8) offers a poor fit (Chi square/df > 5, GFI, TLI < .9, RMSEA > .08). Since the tested model was not valid, the researcher did the process of improving the model by removing several items due to low factor loading.
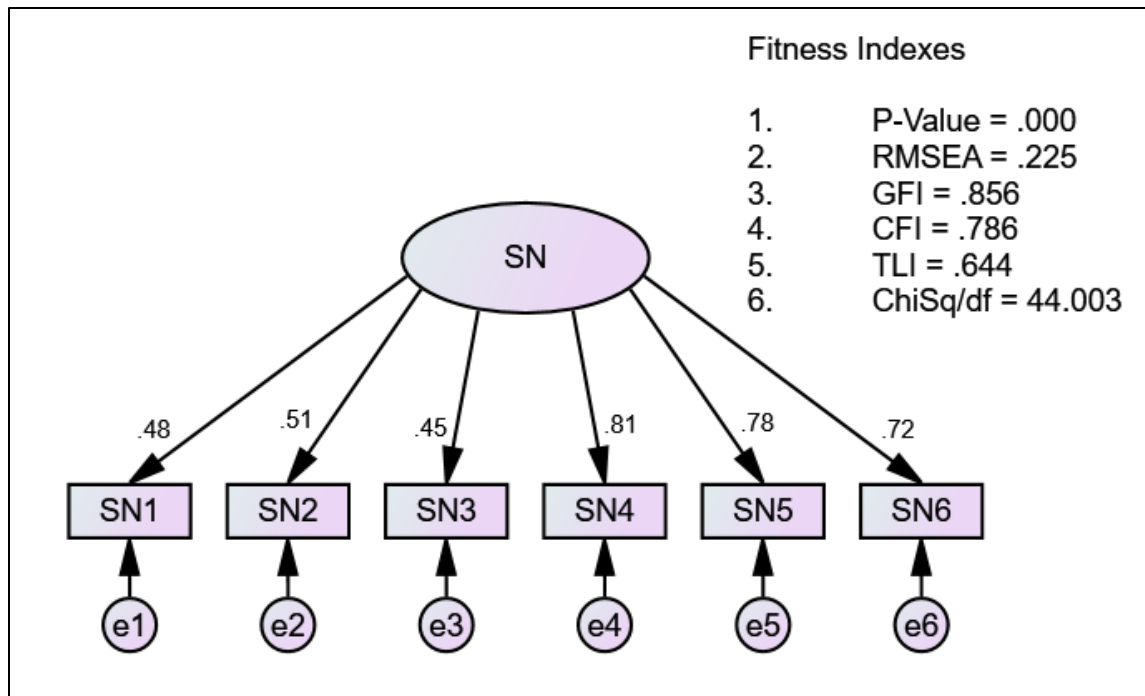
Figure 4.8. The Initial Measurement Model of Perceived Usefulness

Figure 4.9. The Revised Measurement Model of Perceived Usefulness

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Two items were dropped from the initial model due to low factor loading, namely PU3, and PU4. The error variances were also stabilised (e1 and e6, e1 and e2) to achieve model fit. The revised measurement model for perceived usefulness with remaining five items is shown in Figure 4.9. The AVE value reported exceeded the minimum of 50% (52%) and CR exceeded .60 (.84), suggesting adequate reliability. Hence, all th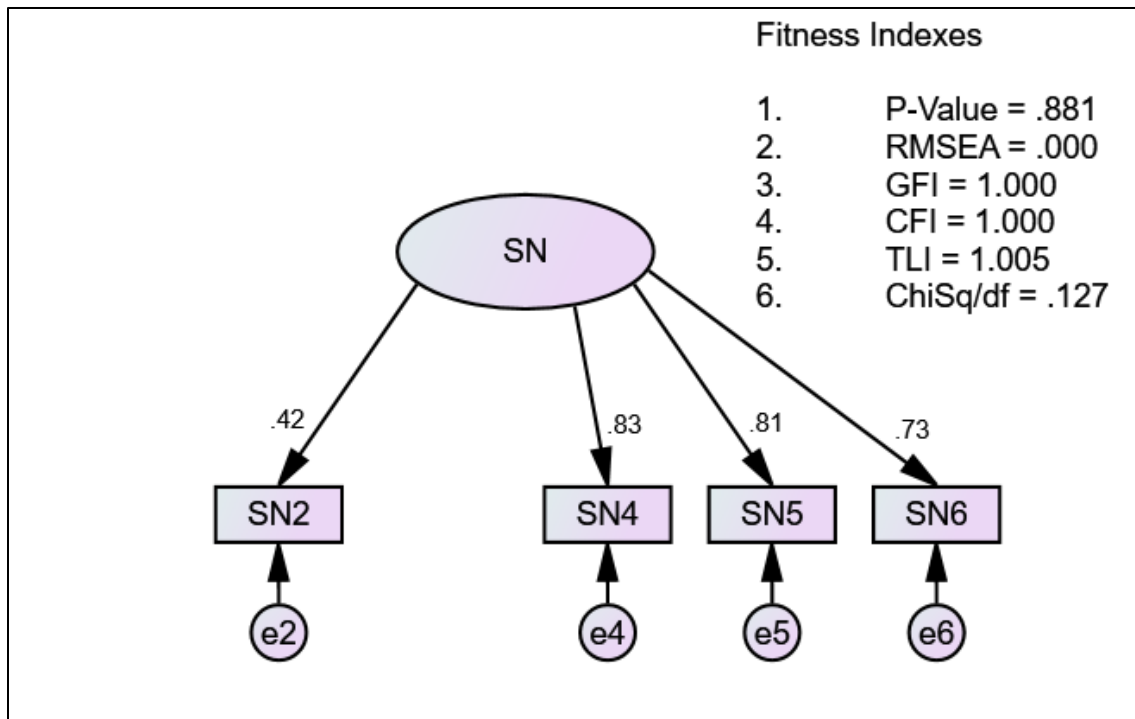e items were significant as required by convergent validity. As a result, the revised model is considered has passed all the criterion values (Chi square/df < 5, GFI, TLI, CFI > .9, RMSEA < .08) and shown a better fit with the data obtained.

4.4.1.4.5 Perceived Ease of Use

There were six items measuring perceived ease of use of ICT for self-paced learning. Table 4.17 depicts on the perceived ease of use of undergraduates in utilizing ICT for self-paced learning. Item PEOU2 "I find it easy to obtain materials using ICT for my self-paced learning" scored the highest mean (3.85) with a standard deviation of 0.73. Whereas, item PEOU3 "My interaction with ICT is clear for self-paced learning" scored lowest mean with a value of 3.53 (S.D. = 0.73).

Table 4.17

Descriptive Statistics for Perceived Ease of Use

Code	Item	M	S.D.
PEOU1	Learning to use ICT for self-paced learning is easy for me.	3.72	0.73
PEOU2	I find it easy to obtain materials using ICT for my self-paced learning.	3.85	0.73
PEOU3	My interaction with ICT is clear for self-paced learning.	3.53	0.73
PEOU4	My interaction with ICT is understandable for self-paced learning.	3.64	0.68
PEOU5	It is easy for me to become skilful at using ICT for self-paced learning.	3.62	0.75
PEOU6	Overall, I find that ICT is easy to use for my self-paced learning.	3.79	0.72

The inter-item correlation matrix is shown in Table 4.18. The maximum correlation of an item with at least one of the item was $.30 > r < .90$. Thus, all the items in the construct were found to have correlated adequately.

Table 4.18

Inter-item Correlation for Items in Perceived Ease of Use

	PEOU1	PEOU2	PEOU3	PEOU4	PEOU5	PEOU6
PEOU1	1.00					
PEOU2	.54	1.00				
PEOU3	.42	.42	1.00			
PEOU4	.41	.37	.64	1.00		
PEOU5	.42	.37	.42	.39	1.00	
PEOU6	.54	.48	.46	.51	.54	1.00

However, the initial measurement model (Figure 4.10) offers a poor fit (Chi square/df > 5, GFI, TLI < .9, RMSEA > .08). Since the tested model was not valid, the researcher did the process of improving the model by removing several items due to low factor loading.
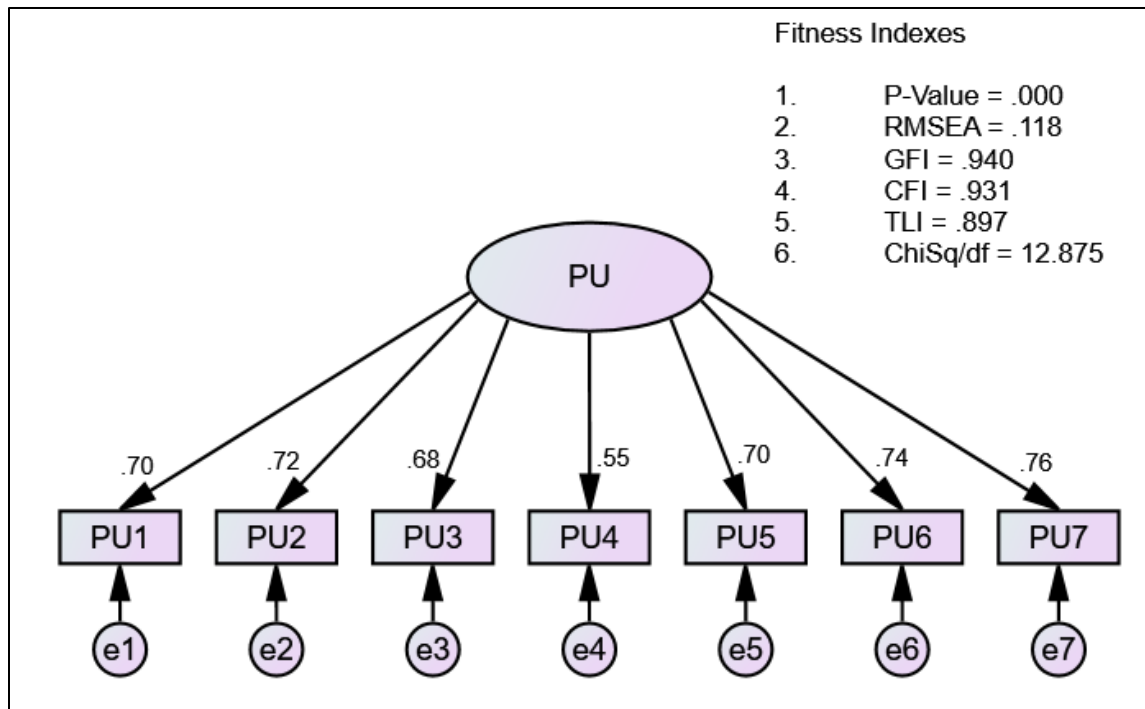

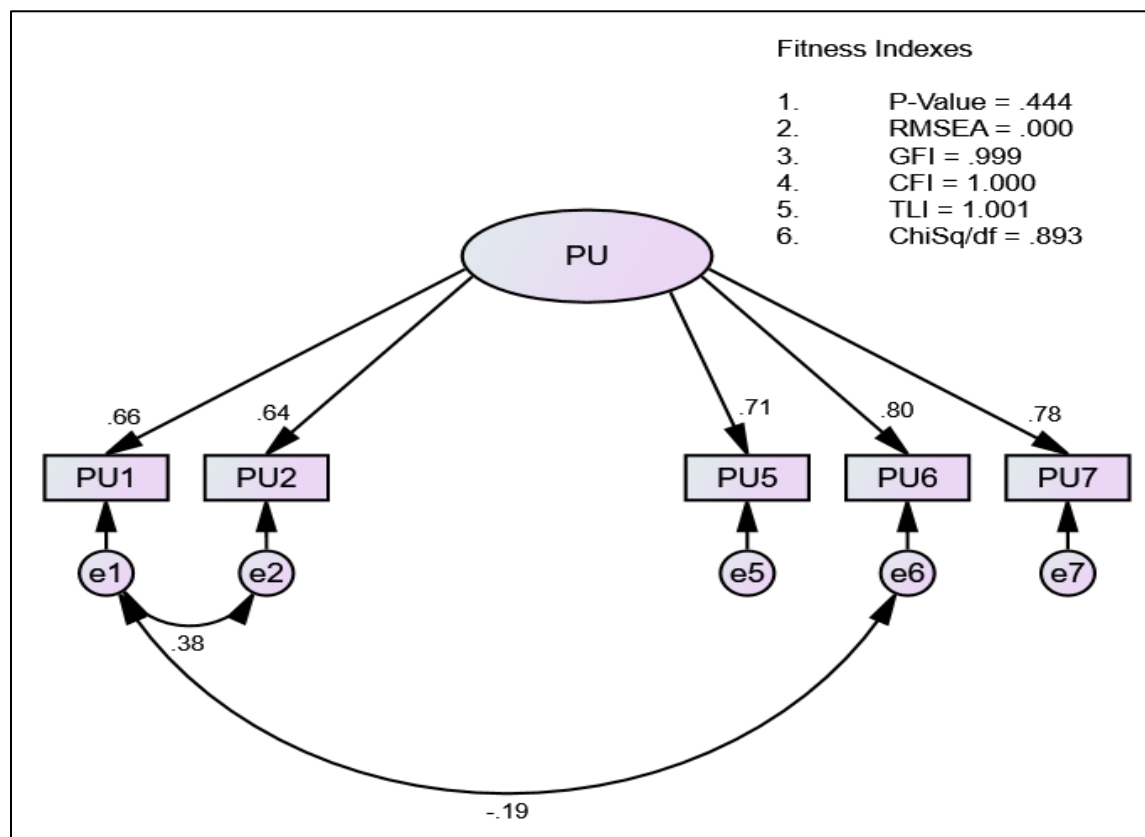Figure 4.10. The Initial Measurement Model of Perceived Ease of Use

Two items were dropped from the initial model due to low factor loading, namely PEOU2, and PEOU5. The error variance was also stabilised (e1 and e6) to achieve model fit. The revised measurement model for motivation with remaining four items is shown in Figure 4.11. A reading of 50% was obtained for AVE and CR exceeded .60 (.71), suggesting adequate reliability. Hence, all the items were significant as required by convergent validity.

Figure 4.11. The Revised Measurement Model of Perceived Ease of Use

As a result, the revised model is considered has passed all the criterion values (Chi square/df < 5, GFI, TLI, CFI > .9, RMSEA < .08) and shown a better fit with the data obtained.

4.4.1.4.6 Attitude towards Using ICT

There were six items measuring attitude towards using ICT for self-paced learning. Table 4.19 depicts on attitude towards using ICT for self-paced learning among the undergraduates. Item A3 "I feel that using ICT for my self-paced learning is a good idea"

scored the highest mean (3.92) with a standard deviation of 0.66. Whereas, item A4 "I have

a generally favourable attitude towards using ICT for my self-paced learning" scored

lowest mean with a value of 3.68 (S.D. = 0.71).

Table 4.19

Descriptive Statistics for Attitude towards Using ICT

Code	Item	M	S.D.
A1	ICT is an important source to maintain my interest in achieving my learning goals through self-paced learning.	3.74	0.73
A2	ICT is an important tool to maintain my interest in achieving my learning goals through self-paced learning.	3.75	0.72
A3	I feel that using ICT for my self-paced learning is a good idea.	3.92	0.66
A4	I have a generally favourable attitude towards using ICT for my self-paced learning.	3.68	0.71
A5	I feel that using ICT makes self-paced learning more interesting.	3.80	0.74
A6	I feel better using ICT for self-paced learning as it provides better access.	3.87	0.69

The inter-item correlation matrix is shown in Table 4.20. The maximum correlation

of an item with at least one of the item was $.30 > r < .90$. Thus, all the items in the construct

were found to have correlated adequately.

Table 4.20

Inter-item Correlation for Items in Attitude towards Using ICT

	A1	A2	A3	A4	A5	A6
A1	1.00					
A2	.69	1.00				
A3	.39	.42	1.00			
A4	.37	.41	.44	1.00		
A5	.44	.41	.42	.51	1.00	
A6	.47	.45	.49	.45	.55	1.00

However, the initial measurement model (Figure 4.12) offers a poor fit (Chi square/df > 5, GFI, TLI < .9, RMSEA > .08). Since the tested model was not valid, the researcher did the process of improving the model by removing several items due to low factor loading.
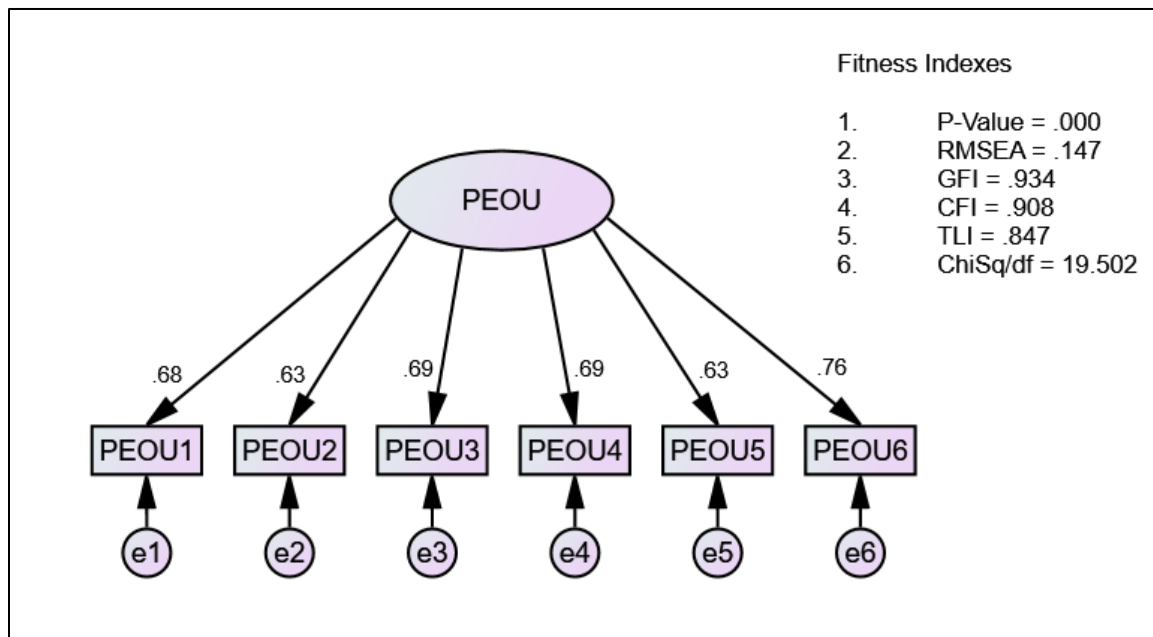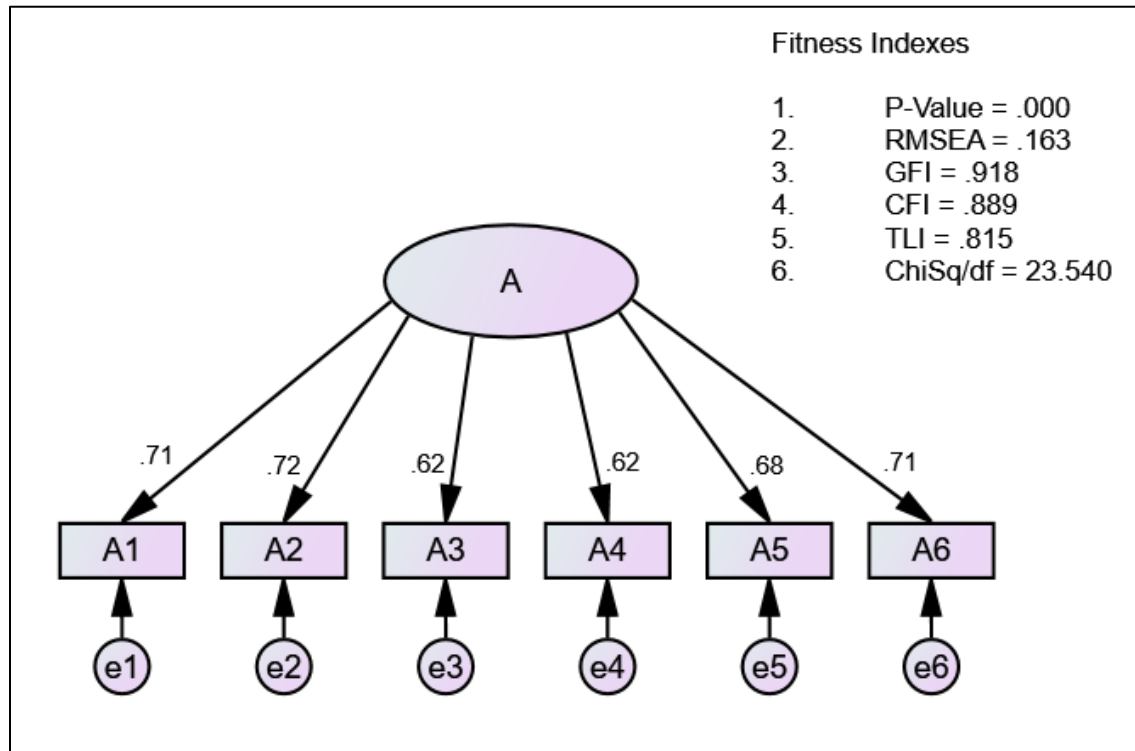

Figure 4.12. The Initial Measurement Model of Attitude towards Using ICT

Two items were dropped from the initial model due to low factor loading, namely A1 and A2. The revised measurement model for motivation with remaining four items is shown in Figure 4.13. The AVE value reported for this model achieved the minimum requirement of 50% (50%) and CR exceeded .60 (.80), suggesting adequate reliability. Hence, all the items were significant as required by convergent validity.
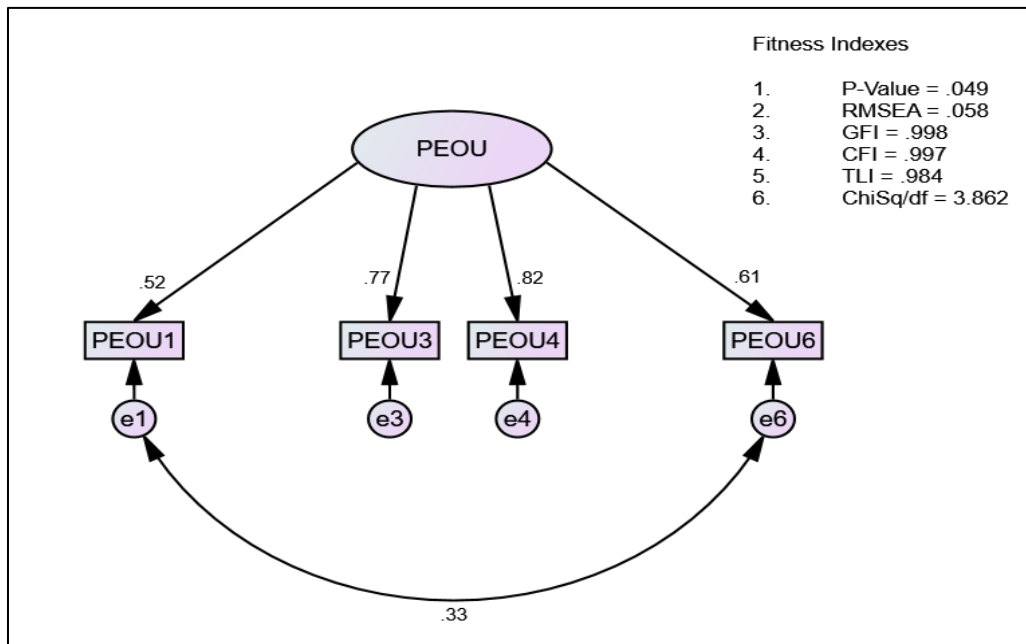
Figure 4.13. The Revised Measurement Model of Attitude towards Using ICT

As a result, the revised model is considered has passed all the criterion values (Chi square/df < 5, GFI, TLI, CFI > .9, RMSEA < .08) and shown a better fit with the data obtained.

4.4.1.4.7 Behavioural Intention to Use ICT

There were four items measuring behavioural intention to use ICT for self-paced learning. Table 4.21 depicts on the behavioural intention to use ICT for self-paced learning among the undergraduates. Item BI4 "I have the intention to learn more about using ICT for my self-paced learning in near future" scored the highest mean (3.96) with a standard deviation of 0.73. Whereas, item BI3 "I plan to use ICT for my self-paced learning in near future" scored lowest mean with a value of 3.88 (S.D. = 0.73).

Table 4.21

Descriptive Statistics for Behavioural Intention to Use ICT

Code	Item	M	S.D.
BI1	I have the intention to use ICT for my self-paced learning in near future.	3.93	0.74
BI2	I predict that I would be using ICT in my self-paced learning in near future.	3.95	0.72
BI3	I plan to use ICT for my self-paced learning in near future.	3.88	0.73
BI4	I have the intention to learn more about using ICT for my self-paced learning in near future.	3.96	0.73

The inter-item correlation matrix is shown in Table 4.22. The maximum correlation of an item with at least one of the item was $.30 > r < .90$. Thus, all the items in the construct were found to have correlated adequately.

Table 4.22

Inter-item Correlation for Items in Behavioural Intention to Use ICT

	BI1	**BI2**	**BI3**	**BI4**
BI1	1.00			
BI2	.65	1.00		
BI3	.62	.69	1.00	
BI4	.53	.55	.61	1.00

However, the initial measurement model (Figure 4.14) offers a poor fit (Chi square/df > 5, GFI, TLI < .9, RMSEA > .08). Since the tested model was not valid, the researcher did the process of improving the model by stabilising the error variance (e3 and e4).
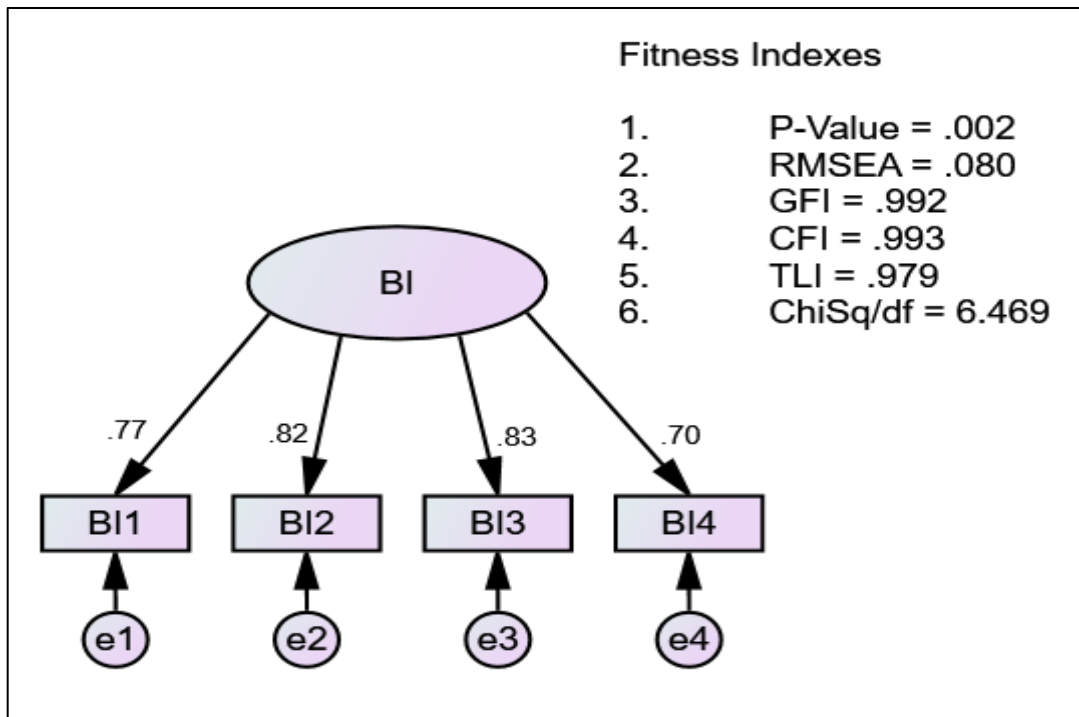
Figure 4.14. The Initial Measurement Model of Behavioural Intention to Use ICT

The revised measurement model for motivation with four items is shown in Figure 4.15. The AVE measure exceeded 50% (61%) and CR exceeded .60 (.86), suggesting adequate reliability. Hence, all the items were significant as required by convergent validity. As shown in Figure 4.15, the revised model is considered has passed all the criterion values (Chi square/df < 5, GFI, TLI, CFI > .9, RMSEA < .08) and shown a better fit with the data obtained.
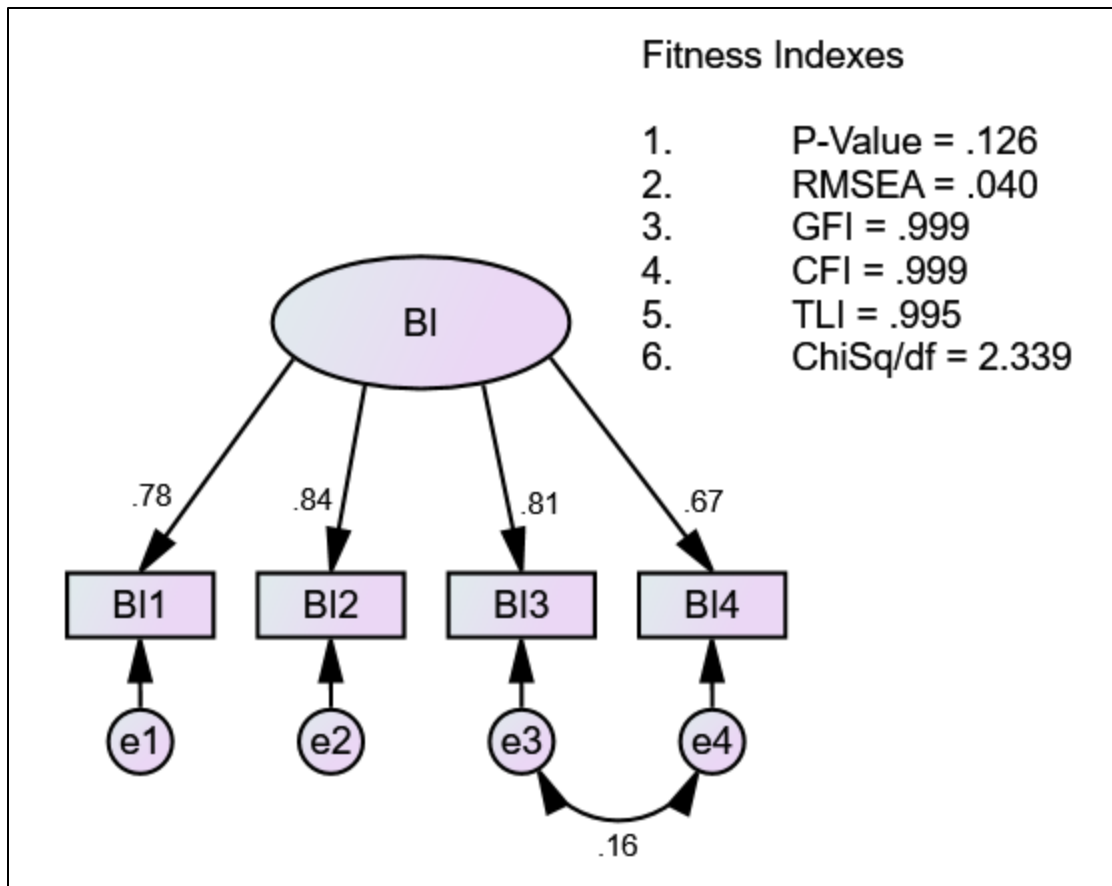
Figure 4.15. The Revised Measurement Model of Behavioural Intention to Use ICT

4.4.1.4.8 Actual ICT Use

There were seven items measuring actual ICT use by the undergraduates for self-paced learning. Table 4.23 depicts on the actual ICT use for self-paced learning among the undergraduates. Item IU2 "I search the internet for information for my assignments" scored the highest mean (4.21) with a standard deviation of 0.77. Whereas, item IU3 "I email lecturer(s)" scored lowest mean with a value of 2.99 (S.D. = 0.97).

Table 4.23

Descriptive Statistics for Actual ICT Use

Code	Item	M	S.D.
IU1	I do my assignments using ICT	4.05	0.84
IU2	I search the internet for information for my assignments	4.21	0.77
IU3	I email lecturer(s)	2.99	0.97
IU4	I download, upload or browse learning materials on my university's website	3.83	1.04
IU5	I use online dictionaries or encyclopaedia	4.03	0.89
IU6	I search different sources online for learning a particular topic that I am interested in	3.92	0.91
IU7	I learn with educational software, games or quizzes	3.40	1.16

The inter-item correlation matrix is shown in Table 4.24. The maximum correlation of an item with at least one of the item was $.30 > r < .90$. Thus, all the items in the construct were found to have correlated adequately.

Table 4.24

Inter-Item Correlation for Items in Actual ICT Use

	IU1	IU2	IU3	IU4	IU5	IU6	IU7
IU1	1.00						
IU2	.78	1.00					
IU3	.28	.28	1.00				
IU4	.35	.36	.30	1.00			
IU5	.31	.37	.27	.38	1.00		
IU6	.44	.50	.32	.36	.54	1.00	
IU7	.28	.29	.30	.25	.35	.51	1.00

However, the initial measurement model (Figure 4.16) offers a poor fit (Chi square/df > 5, GFI, TLI < .9, RMSEA > .08). Since the tested model was not valid, the researcher did the process of improving the model by removing several items due to low factor loading.
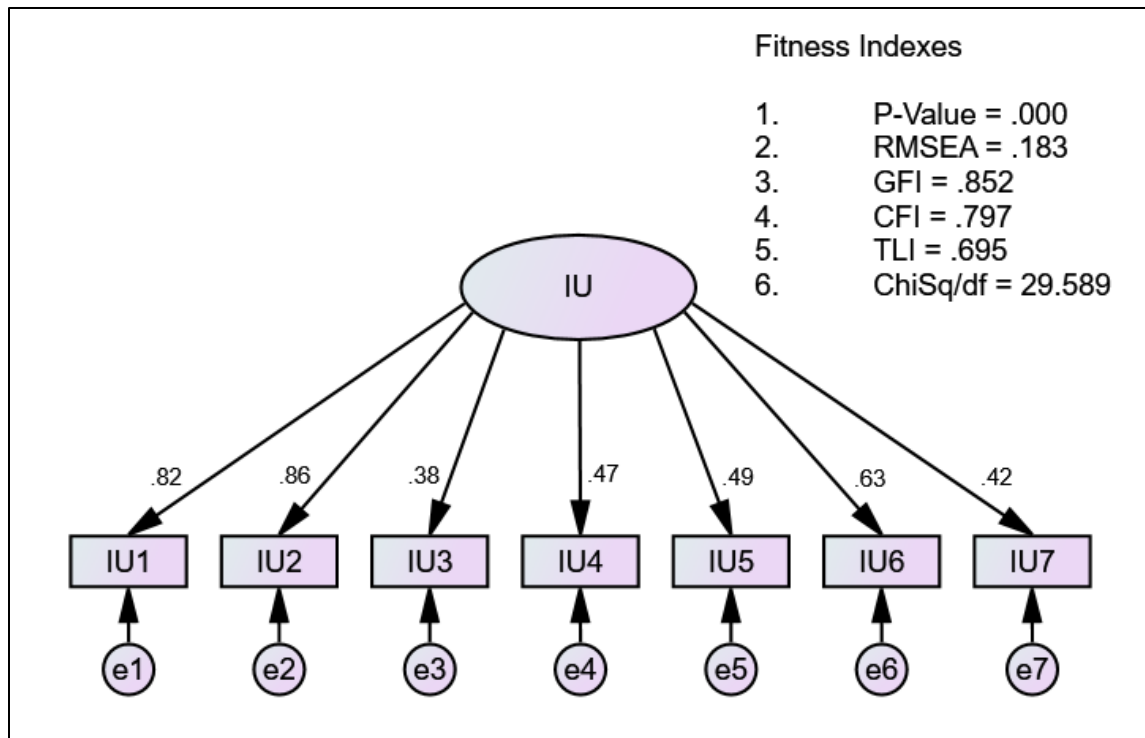
Figure 4.16. The Initial Measurement Model of Actual ICT Usage

The error variance (e5 and e6) was stabilised. The revised measurement model for actual ICT use with four items is shown in Figure 4.17. Three items (IU3, IU4, and IU7) were deleted due to low factor loading. The AVE measure for the measurement model achieved the minimum requirement of 50% and CR exceeded .60 (.78), suggesting adequate reliability. Hence, all the items were significant as required by convergent validity.
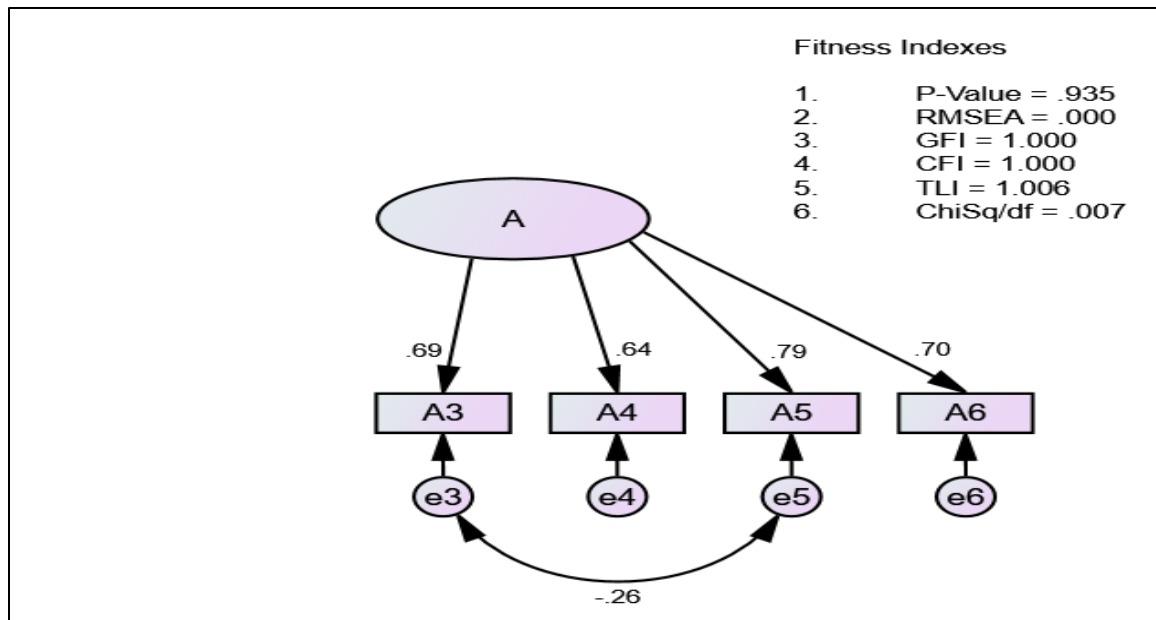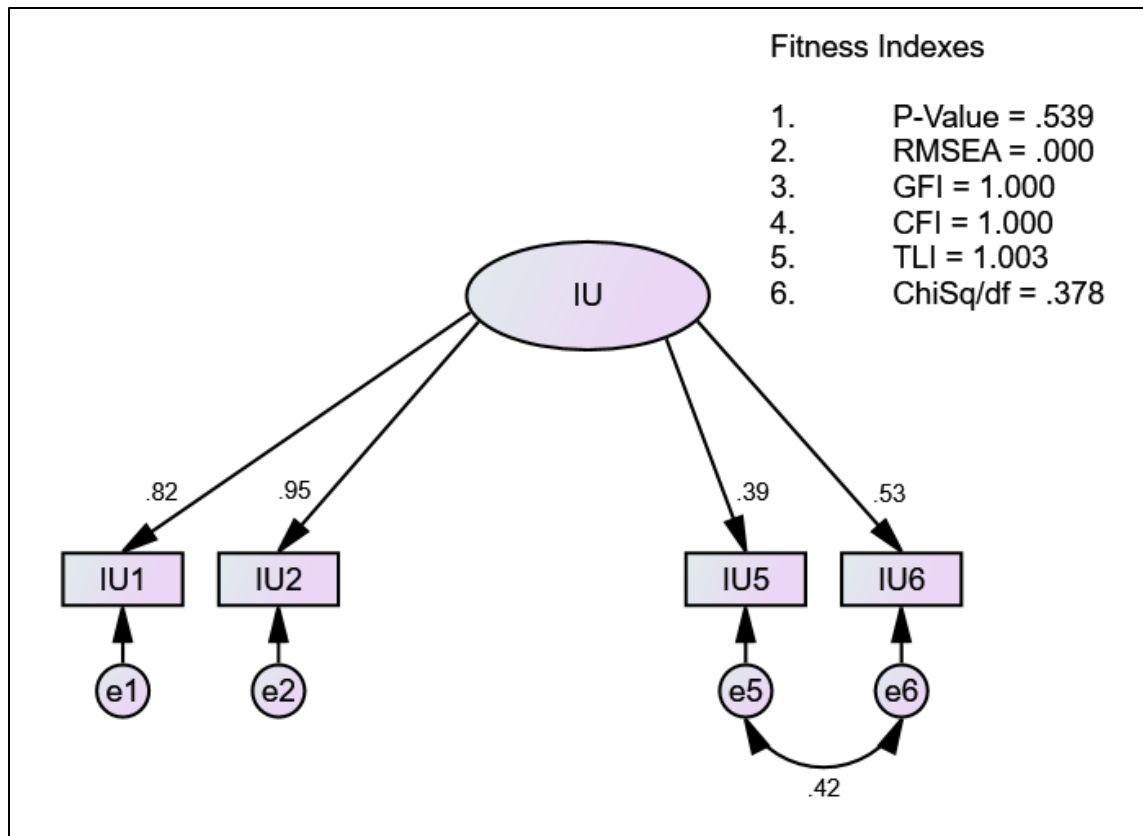
Figure 4.17. The Revised Measurement Model of Actual ICT Use

After revision of the model, it is considered has passed all the criterion values (Chi square/df < 5, GFI, TLI, CFI > .9, RMSEA < .08) and shown a better fit with the data obtained.

4.4.1.4.9 Measurement Model of the Study

This is the final stage to analyse the measurement model of the study before proceeding to the description of the structural model. All the latent constructs involved in this study was independently tested before pooling them into one complete measurement model (Awang, 2012; 2014; 2015; Kashif, Awang, Walsh, & Altaf, 2015; Kashif, Samsi, Awang, & Mohamed, 2016). Figure 4.18 shows the complete measurement model for this study with its eight latent constructs.
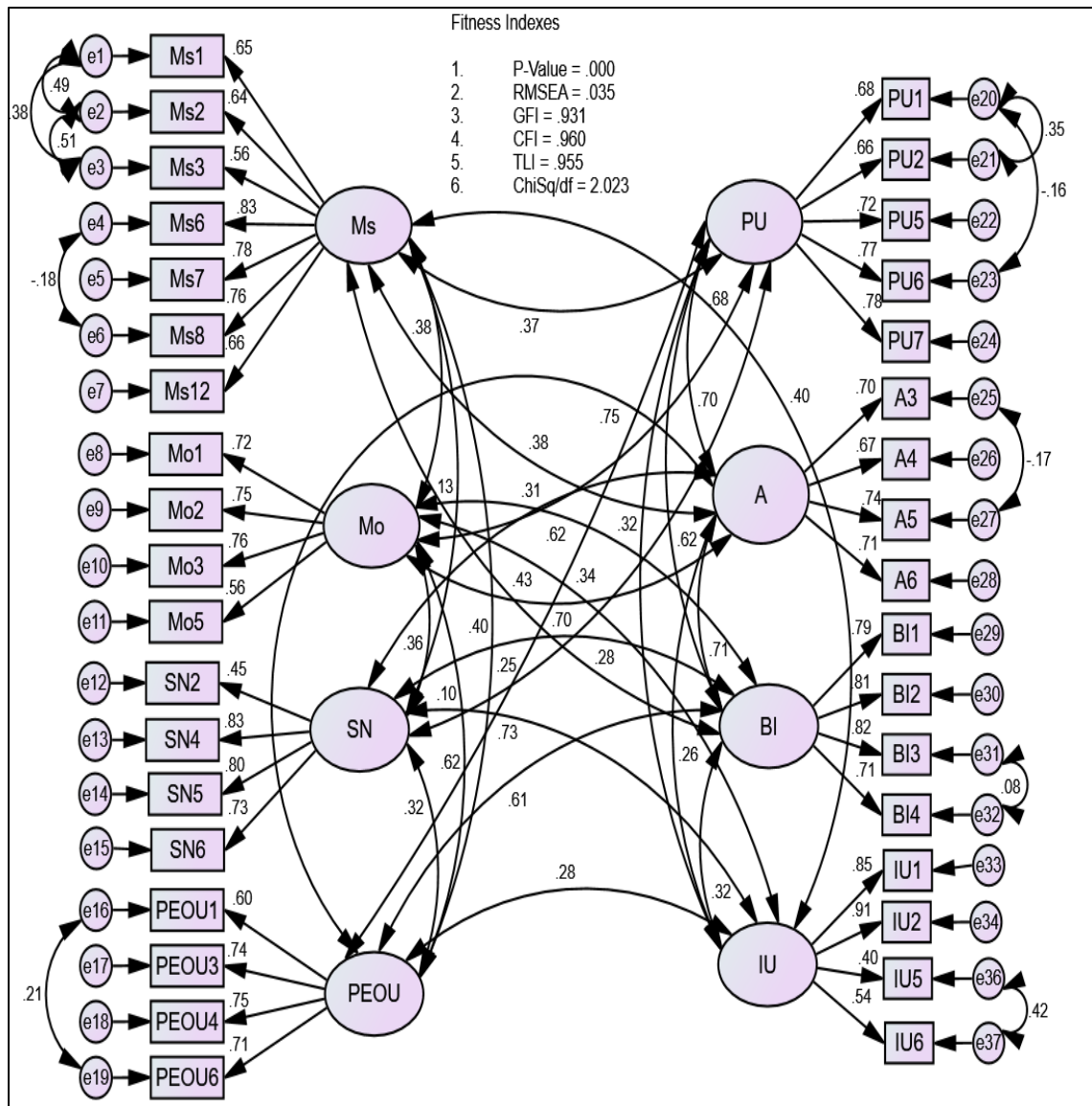
Figure 4.18. The Initial Measurement Model of the Study

The input covariance matrix was generate from 36 indicators measured in the measurement model and it contained 666 sample moments. There are 72 regression weights, 38 covariances, 44 variances and 154 distinct parameters to be estimated. Hence, this model has 556 (666 - 110) degrees of freedom and the chi-square goodness-of-fit statistic, χ^2 (N = 853, df = 556) = 1124.848, p < .05 (Table 4.25).

Table 4.25

Computation of Degrees of Freedom and Chi-square Statistics for the Goodness-of-Fit (Measurement Model)

Notes for Group (Group Number 1)
The model is recursive.
Sample size = 853

Parameter Summary (Group Number 1)

	Weights	Covariances	Variances	Means	Intercepts	Total
Fixed	44	0	0	0	0	44
Labeled	0	0	0	0	0	0
Unlabeled	28	38	44	0	0	110
Total	72	38	44	0	0	154

Computation of degrees of freedom
(Default model)
Number of distinct sample moments: 666
Number of distinct parameters to be estimated: 110
Degrees of freedom (666 - 100): 556

Results
(Default Model)
Minimum was achieved
Chi-square = 1124.848
Degrees of freedom = 556
Probability level = .000

Table 4.26

Regression Weight and Standardized Regression Weights for Measurement Model

			Estimate	S.E.	C.R.	P	Std. Estimate
Ms1	<---	Ms	1.090	.066	16.555	***	.648
Ms2	<---	Ms	1.111	.068	16.289	***	.636
Ms3	<---	Ms	.979	.067	14.514	***	.559
Ms6	<---	Ms	1.344	.069	19.511	***	.831
Ms8	<---	Ms	1.317	.073	18.128	***	.761
Ms7	<---	Ms	1.271	.066	19.236	***	.776
Ms12	<---	Ms	1.000				.659
Mo1	<---	Mo	1.323	.090	14.769	***	.717
Mo2	<---	Mo	1.372	.091	15.153	***	.752
Mo3	<---	Mo	1.355	.089	15.248	***	.761
Mo5	<---	Mo	1.000				.559
SN2	<---	SN	.541	.045	11.976	***	.447
SN4	<---	SN	1.131	.054	21.062	***	.827
SN5	<---	SN	1.039	.050	20.750	***	.799
SN6	<---	SN	1.000				.733
PEOU1	<---	PEOU	.860	.049	17.533	***	.600
PEOU3	<---	PEOU	1.064	.057	18.720	***	.743
PEOU4	<---	PEOU	.990	.053	18.796	***	.747
PEOU6	<---	PEOU	1.000				.706
PU1	<---	PU	1.000				.677
PU2	<---	PU	.989	.047	20.861	***	.665
PU5	<---	PU	1.070	.060	17.875	***	.721
PU6	<---	PU	1.142	.064	17.801	***	.768
PU7	<---	PU	1.134	.060	18.890	***	.776
A3	<---	A	1.000				.697
A4	<---	A	1.037	.061	17.003	***	.672
A5	<---	A	1.186	.068	17.332	***	.735
A6	<---	A	1.064	.060	17.768	***	.709
BI1	<---	BI	1.000				.785
BI2	<---	BI	1.015	.042	24.420	***	.812
BI3	<---	BI	1.027	.043	24.085	***	.816
BI4	<---	BI	.890	.044	20.261	***	.707
IU1	<---	IU	1.000				.849
IU2	<---	IU	.991	.041	24.403	***	.912
IU5	<---	IU	.502	.044	11.489	***	.401
IU6	<---	IU	.694	.043	16.164	***	.544

S.E.: Standard Error of regression weight; C.R.: Critical Ratio for Regression Weight;
P: Level of significance; ***p <.001

Table 4.27

Explained Variances (Squared Multiple Correlations) for the Measurement Model

	Estimate
Ms1	.420
Ms2	.405
Ms3	.312
Ms6	.690
Ms7	.601
Ms8	.579
Ms12	.434
Mo1	.514
Mo2	.566
Mo3	.580
Mo5	.312
SN2	.200
SN4	.684
SN5	.638
SN6	.537
PEOU1	.360
PEOU3	.553
PEOU4	.558
PEOU6	.499
PU1	.458
PU2	.442
PU5	.520
PU6	.590
PU7	.603
A3	.485
A4	.452
A5	.541
A6	.502
BI1	.617
BI2	.660
BI3	.665
BI4	.499
IU1	.721
IU2	.831
IU5	.161
IU6	.295

The explained variances are reported by the squared multiple correlations depicted in Table 4.27. The percentage of variances explained for this model ranged from .161 or 16.1% (IU5) to .831 or 83.1% (IU2).

On the other hand, the initial measurement model (Figure 4.18) fit the data well because the reported value for GFI was more than .9. Based on the modification indices, the fit of the model was further improved by deleting two items (SN2 and IU5) as their loading factors were below the recommended value of .50.

Figure 4.19 depicts the revised measurement model and Table 4.28 illustrates the value of chi-square goodness-of-fit, unstandardized and standardized regression weight for the revised measurement model. Based on the results, the chi-square goodness-of-fit obtained for the revised model (863.988) is lesser than the chi-square value of the initial measurement model (1124.848). This can be concluded that the unstandardized and standardized regression weight obtained from the revised model remained statistically significant based on the critical ratio test.
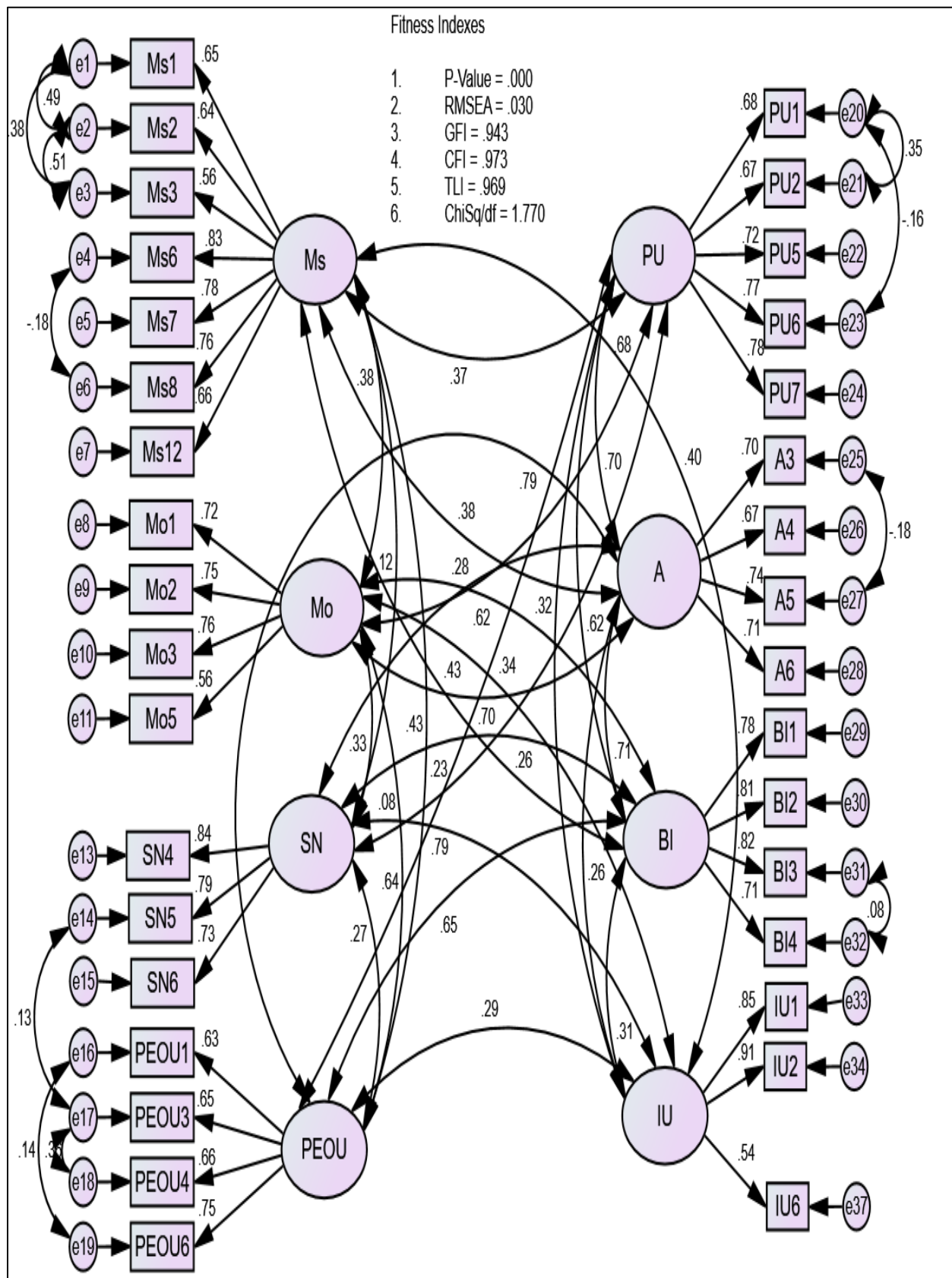
Figure 4.19. The Revised Measurement Model of the Study

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Table 4.28

The Values of Chi-Square Goodness-of-Fit, Unstandardized and Standardized Regression Weight for the Revised Measurement Model

Result (Default model)
Minimum was achieved
Chi-square = 863.988
Degrees of freedom = 488
Probability level = .000

			Estimate	S.E.	C.R.	P	Std. Estimate
Ms1	<---	Ms	1.089	.066	16.551	***	.648
Ms2	<---	Ms	1.111	.068	16.295	***	.636
Ms3	<---	Ms	.978	.067	14.515	***	.559
Ms6	<---	Ms	1.343	.069	19.518	***	.831
Ms7	<---	Ms	1.271	.066	19.244	***	.776
Ms8	<---	Ms	1.317	.073	18.133	***	.761
Ms12	<---	Ms	1.000				.659
Mo1	<---	Mo	1.324	.090	14.762	***	.717
Mo2	<---	Mo	1.371	.091	15.141	***	.752
Mo3	<---	Mo	1.356	.089	15.244	***	.762
Mo5	<---	Mo	1.000				.559
SN4	<---	SN	1.141	.055	20.763	***	.836
SN5	<---	SN	1.024	.050	20.529	***	.793
SN6	<---	SN	1.000				.734
PEOU1	<---	PEOU	.859	.047	18.094	***	.632
PEOU3	<---	PEOU	.888	.052	16.952	***	.655
PEOU4	<---	PEOU	.826	.049	17.007	***	.659
PEOU6	<---	PEOU	1.000				.746
PU1	<---	PU	1.000				.678
PU2	<---	PU	.989	.047	20.928	***	.665
PU5	<---	PU	1.069	.060	17.945	***	.721
PU6	<---	PU	1.137	.064	17.826	***	.766
PU7	<---	PU	1.135	.060	19.002	***	.778
A3	<---	A	1.000				.698
A4	<---	A	1.033	.061	17.002	***	.671
A5	<---	A	1.185	.068	17.355	***	.736
A6	<---	A	1.062	.060	17.801	***	.709
BI1	<---	BI	1.000				.785
BI2	<---	BI	1.016	.042	24.414	***	.812
BI3	<---	BI	1.028	.043	24.094	***	.816
BI4	<---	BI	.891	.044	20.260	***	.707
IU1	<---	IU	1.000				.851
IU2	<---	IU	.987	.041	24.055	***	.910
IU6	<---	IU	.692	.043	16.143	***	.543

S.E.: Standard Error of regression weight; C.R.: Critical Ratio for Regression Weight;
P: Level of significance; ***p <.001

A direct comparison of the goodness-of-fit between the initial and revised measurement model was made in order to test the improvement in fit. The test of the initial model against the revised model was obtained by subtracting the smaller chi-square value (1124.848 - 863.988) and the smaller degrees of freedom (556 - 488). The value obtained were x^2 = 264.86 and df = 68.

Based on the x^2 distribution table, a chi-square value of 264.86 with 68 degrees of freedom was found to be significant at 0.05 level. From this test, it means that the revised model is a better fit than the initial model. Hence, the revised model with a smaller x^2 value can produce a better fit for the data than the initial model. The evaluation for convergent validity was made based on the value of AVE which is presented in Table 4.29.

Table 4.29

The CR and AVE for the Main Construct

Factor	Items	Factor Loading	CR (above 0.6)	AVE (above 0.5)
Ms	Ms1	.65	0.87	0.61
	Ms2	.64		
	Ms3	.56		
	Ms6	.83		
	Ms7	.78		
	Ms8	.76		
	Ms12	.66		
Mo	Mo1	.72	0.79	0.50
	Mo2	.75		
	Mo3	.76		
	Mo5	.56		
SN	SN4	.84	0.83	0.62
	SN5	.79		
	SN6	.73		
PEOU	PEOU1	.63	0.77	0.50
	PEOU3	.65		
	PEOU4	.66		
	PEOU6	.75		
PU	PU1	.68	0.85	0.52
	PU2	.67		
	PU5	.72		
	PU6	.77		

	PU7	.78		
A	A3	.70	**0.77**	**0.50**
	A4	.67		
	A5	.74		
	A6	.71		
BI	BI1	.78	**0.86**	**0.61**
	BI2	.81		
	BI3	.82		
	BI4	.71		
IU	IU1	.85	**0.82**	**0.62**
	IU2	.91		
	IU6	.54		

With reference to the AVE and CR values in Table 4.29, the study establish that all AVE and CR surpass their respective threshold values of 0.5 and 0.6 respectively (Awang, 2015). Thus, the study has achieved the convergent validity and composite reliability for all latent constructs in the pooled CFA.

Table 4.30 represents the discriminant validity for the measurement model. The bold diagonal values are the square root of the AVE of the individual constructs while other values are the correlation between the corresponding pair of factors. The discriminant validity of the each factor is obtained if the square root of its AVE surpasses its correlation value with other factors in the model. In other words, the discriminant validity is obtained if the diagonal values are greater than any other values in its row and column (Awang, 2015; Kashif, Samsi, Awang, & Mohamed, 2016). The presented values in Table 4.30 meet the recommended value of discriminant validity. Thus, the study concludes that the discriminant validity for all constructs is attained.

Table 4.30

Discriminant Validity for the Measurement Model

	BI	Ms	Mo	SN	PEOU	PU	A	IU
BI	**0.781**							
Ms	0.428	**0.701**						
Mo	0.622	0.380	**0.702**					
SN	0.256	0.116	0.333	**0.789**				
PEOU	0.608	0.430	0.642	0.270	**0.674**			
PU	0.617	0.372	0.682	0.232	0.668	**0.723**		
A	0.703	0.381	0.700	0.279	0.654	0.699	**0.704**	
IU	0.314	0.403	0.339	0.080	0.286	0.318	0.257	**0.785**

Note. Off-diagonal: Correlation Between the constructs
Diagonal in bold: Square root average variance extracted (AVE) from the manifest variables
(items/measured indicators)

The fit indices namely GFI, TLI and CFI were also tested in this study and were found to exceed .90. Moreover, the RMSEA value reported in the proposed model in the population was .033 and thus, deemed as acceptable. Therefore, the revised measurement model of the study (Figure 4.19) fits the data adequately (Chi-square/df < 3, GFI, TLI, CFI > .9, and RMSEA < .08) (Table 4.31).

Table 4.31

The Fitness Indexes of the Construct Obtained

Name of category	Name of index	Recommended Index value	Index value obtained	Comments
Absolute fit	RMSEA	< .08	0.300	The required level is achieved
	GFI	> .90	0.943	
Incremental fit	CFI	> .90	0.973	The required level is achieved
	TLI	> .90	0.969	
Parsimonious fit	Chisq/df	< 3	1.770	The required level is achieved

Note. Adapted from SEM made simple, by Awang. Copyright by Zainuddin Awang.

4.4.1.5 Specifying the Structural Model (Stage 5)

The model had been tested and proved to have a sufficient fit. In the measurement model, each of the variables were correlated and tested independently. At this stage however, the researcher have specified the structural model according to the proposed theoretical model in this study. The researcher have assigned the influence from a variable to another variable representing the hypothesis of the study in specified model. The predicator antecedents investigated were mastery, motivation, subjective norm, perceived ease of use, perceived usefulness, behavioural intention to use ICT, and attitude towards using ICT. Based on the literature review, the proposed structural paths are:

H1: Mastery has a significant influence on Perceived Usefulness.

H2: Mastery has a significant influence on Perceived Ease of Use.

H3: Motivation has a significant influence on Perceived Usefulness.

H4: Subjective Norm has a significant influence on Perceived Usefulness.

H5: Subjective Norm has a significant influence on Behavioral Intention to Use ICT.

H6: Perceived Ease of Use has a significant influence on Perceived Usefulness.

H7: Perceived Ease of Use has a significant influence on Attitude towards Using ICT.

H8: Perceived Usefulness has a significant influence on Attitude towards Using ICT.

H9: Perceived Usefulness has a significant influence on Behavioral Intention to Use ICT.

H10: Attitude toward Using has s significant influence on Behavioral Intention to Use ICT.

H11: Behavioral Intention to Use ICT has a significant influence on Actual ICT Use

for Self-paced Learning.

The following Figure 4.20 depicts the paths specified by the proposed research model. There are three exogenous constructs in the structural model (Ms: Mastery; Mo: Motivation; SN: Subjective Norm) which are not predicted by any constructs. Apart from that, in this model, five endogenous constructs are present, namely, perceived ease of use

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(PEOU), perceived usefulness (PU), attitude towards using ICT (A), behavioural intention to use ICT (BI), and actual ICT use (IU). Each of the constructs are predicted by other constructs and at the same time, it predicts other constructs as well. Hence, this model is ready to be tested together with dependence relationship.
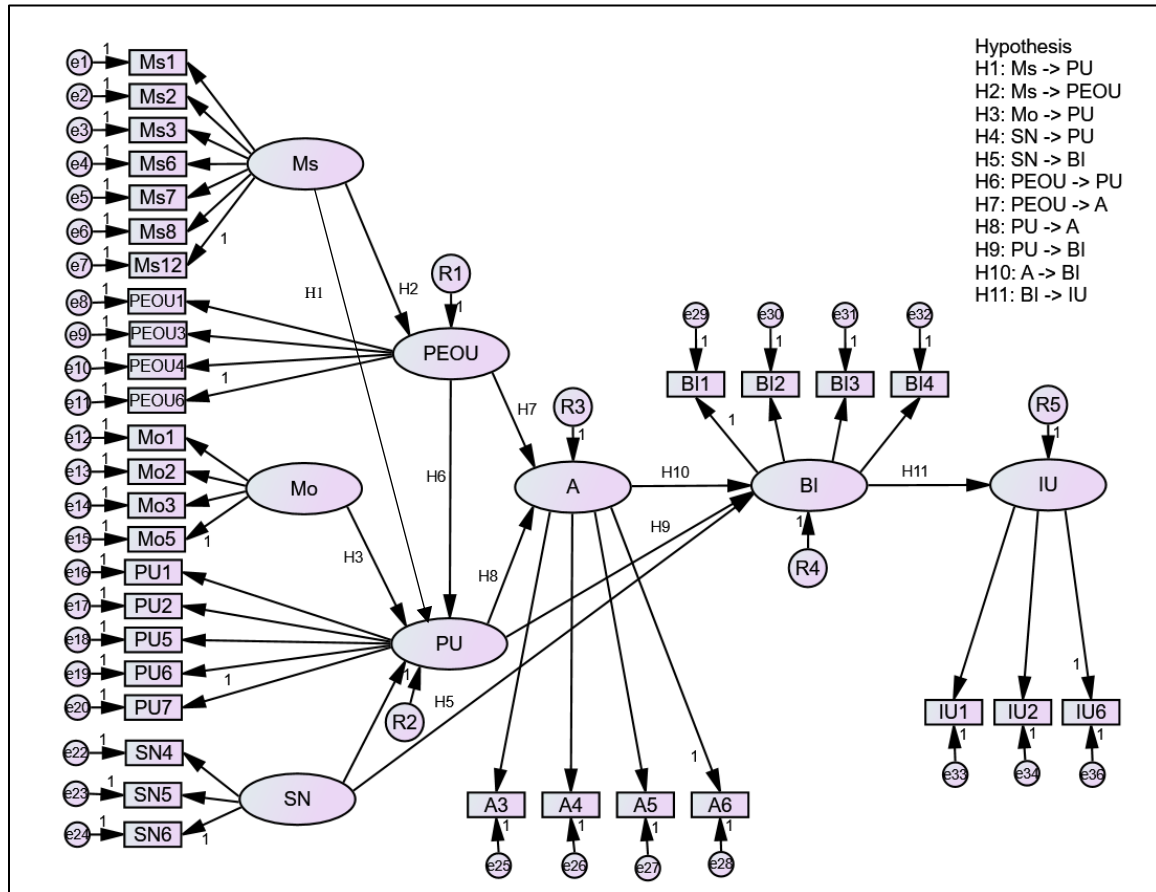

Figure 4.20. Path Diagram illustrating Specified Hypothesized Structural Path and Measurement Model and Measurement Specification

4.4.1.6 Assessing Structural Model Validity (Stage 6)

The final stage was conducted to access the validity of the structural model and the hypothesis theoretical paths of the study, as recommended by Hair, Black, Babin, Anderson, and Tathum (2014) and Awang (2015). As can be found from the Figure 4.19, the factor loadings are higher than .50 except for SN2 (.43) and IU5 (.43) (Figure 4.18) in

which were deleted. Moreover, the parameter stability among the indicators was also established. As for the overall fit of the structural model x^2 (Figure 4.21) is 1990.238 with 516 degrees of freedom (p < .05). In the meantime, x^2/df is 3.857, TLI and CFI is lower than the required value of .90 (.88 and .89, respectively). RMSEA is .058, which is lower than 0.08.
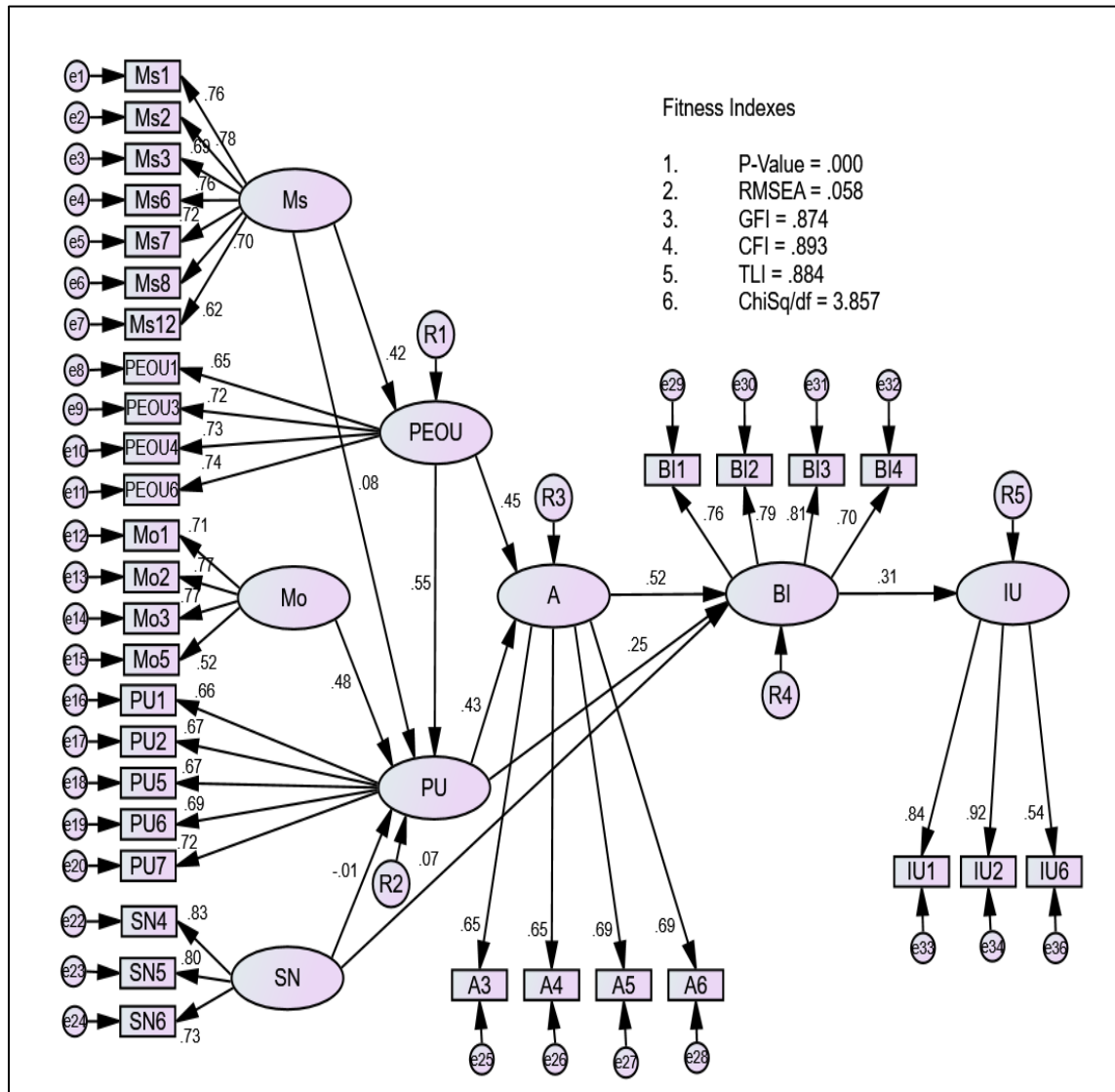

Figure 4.21. The Initial Proposed Structural Model of the Study

It can be noted that the validation of the structural model was not adequate. The process of improvement was done by the researcher using the modification indices.

Through the examination of the indices, it suggested that model fit could be enhanced by stabilising error variance (e1 and e2, e1 and e3, e2 and e3, e4 and e5, e9 and e10, e17 and e16, e19 and e20) was stabilised. After making such improvement on the model, it fit relatively well with the data (Chi-square/df < 3, GFI, TLI. CFI > .9, RMSEA < .08). The revised model research model is presented in Figure 4.22.
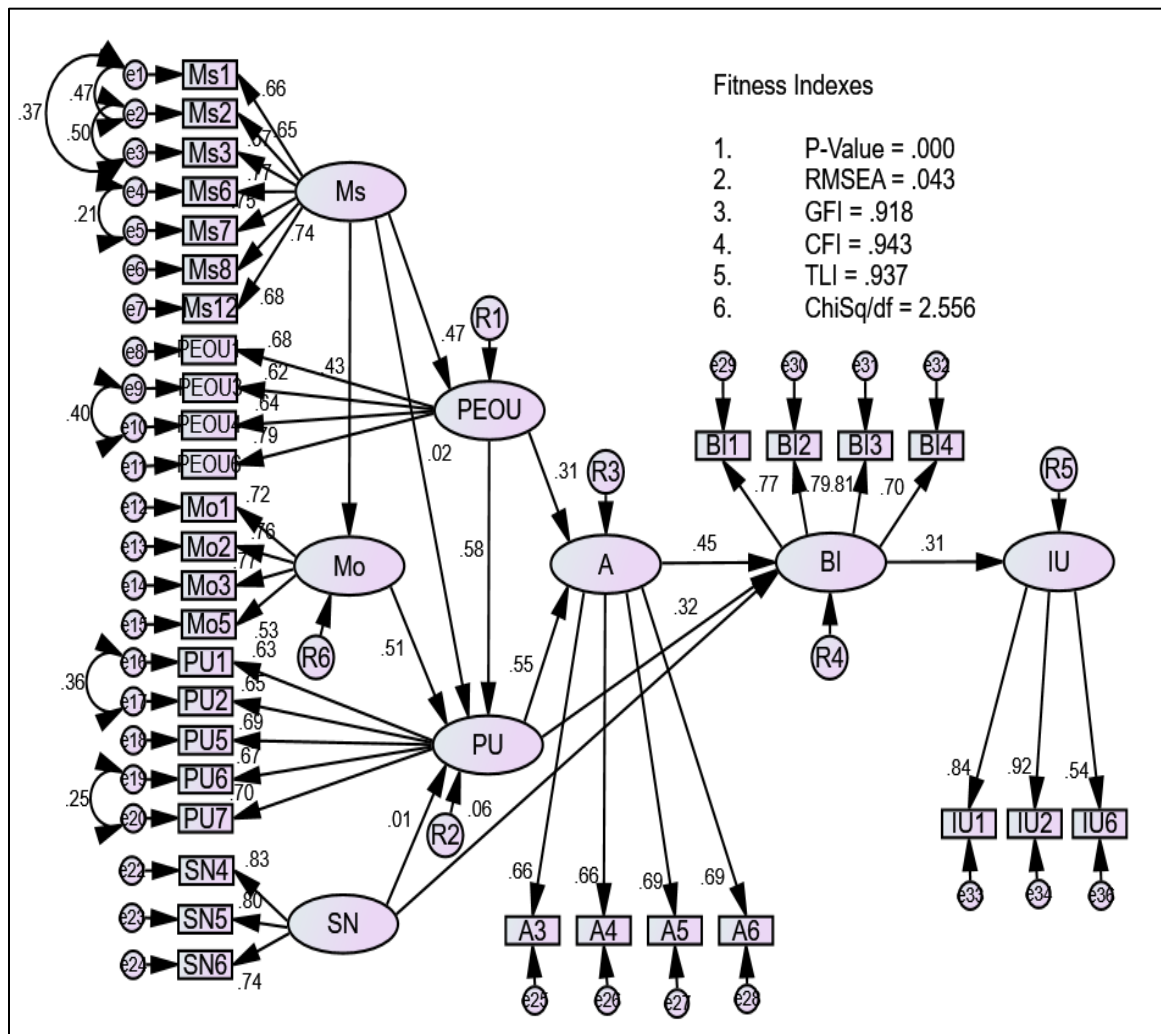

Figure 4.22. The Revised Structural Model of the Study

The unstandardized and standardized regression weight for the revised structural model are shown in Table 4.32.

Table 4.32

Regression Weight and Standardized Regression Weight for Revised Structural Model

Hypothesis	Path			Estimate	S.R.	C.R.	P	Std. Estimate
H1	Ms	→	PU	.016	.044	.374	.708	.016
H2	Ms	→	PEOU	.632	.059	10.641	***	.474
H3	Mo	→	PU	.641	.063	10.218	***	.512
H4	SN	→	PU	.009	.022	.400	.689	.012
H5	SN	→	BI	.056	.028	1.976	.048	.062
H6	PEOU	→	PU	.458	.037	12.267	***	.581
H7	PEOU	→	A	.251	.045	5.568	***	.307
H8	PU	→	A	.575	.062	9.306	***	.554
H9	PU	→	BI	.393	.080	4.935	***	.322
H10	A	→	BI	.535	.080	6.682	***	.455
H11	BI	→	IU	.279	.038	7.394	***	.314

S.E.: Standard Error of regression weights; C.R.: Critical Ration for regression weight; P: Level of Significance, ***p < .001

4.4.2 Hypothesis Validation

Based on the hypothesis testing summary shown in Table 4.33, the proposed structural paths of the model can be answered following the research questions and hypothesis.

4.4.2.1 Hypothesis 1: Mastery has a significant influence on Perceived Usefulness

Hypothesis one suggests that the undergraduates' mastery of ICT has a significant influence on their perceived usefulness towards utilizing ICT for self-paced learning. But, the findings showed no significant influence of mastery on perceived usefulness of undergraduates towards the utilization of ICT for self-paced learning ($\beta = 0.016$, p > 0.05). Thus, Hypothesis H1 is not supported.

4.4.2.2 Hypothesis 2: Mastery has a significant influence on Perceived Ease of Use

Hypothesis two investigates the influence of mastery on perceived ease of use of ICT for self-paced learning among the undergraduates. Based on the findings, there was a

significance influence of mastery on perceived ease of use of ICT for self-paced learning ($\beta = 0.474$, $p < 0.001$). Hence, the hypothesis H2 is supported.

4.4.2.3 Hypothesis 3: Motivation has a significant influence on Perceived Usefulness

The third hypothesis in this study suggested that there is a significant influence of motivation toward perceived usefulness among the undergraduates when it comes to using ICT for self-paced learning. Thus, H3 is supported in this study as motivation had an influence towards perceived usefulness ($\beta = 0.512$, $p < 0.001$).

4.4.2.4 Hypothesis 4: Subjective Norm has a significant influence on Perceived Usefulness

The fourth hypothesis postulates that subjective norm have a significant influence on perceived usefulness. However, the results of the study revealed that there is no influence of subjective norm on perceived usefulness ($\beta = 0.012$, $p > 0.05$). Thus, hypothesis four is not supported.

4.4.2.5 Hypothesis 5: Subjective Norm has a significant influence on Behavioural Intention to Use ICT

The fifth hypothesis assumes that subjective norm significantly influence undergraduates' behavioural intention to use ICT for self-paced learning. A significant coefficient is associated with the path linking subjective norm and behavioural intention to use ICT. Thus, the hypothesis H5 is supported and a significant influence was found from the result ($\beta = 0.062$, $p < 0.05$).

4.4.2.6 Hypothesis 6: Perceived Ease of Use has a significant influence on Perceived Usefulness

Hypothesis six suggested that perceived ease of use had a significant influence on the undergraduates perceived usefulness of ICT for self-paced learning. From the results, perceived ease of use was proven that it did have significantly influenced undergraduates' perceived usefulness of ICT for self-paced learning ($\beta = 0.581$, $p < 0.001$). Hence, it can be concluded that hypothesis six is supported.

4.4.2.7 Hypothesis 7: Perceived Ease of Use has a significant influence on Attitude towards Using ICT

Hypothesis seven investigates the influence of perceived ease of use on attitude towards using ICT for self-paced learning. Based on the findings, perceived ease of use path linked to attitude towards using ICT showed a significant coefficient ($\beta = 0.307$, $p < 0.05$), which resulted in supporting the seventh hypothesis of this study.

4.4.2.8 Hypothesis 8: Perceived Usefulness has a significant influence on Attitude towards Using ICT

The eighth hypothesis proposed that perceived usefulness had a significant influence on attitude towards using ICT for self-paced learning among the undergraduates. The result showed an influence that was significant between perceived usefulness and behavioural intention to use ICT ($\beta = 0.554$, $p < 0.001$). Thus, hypothesis eight is supported in this study.

4.4.2.9 Hypothesis 9: Perceived Usefulness has a significant influence on Behavioural Intention to Use ICT

Hypothesis nine suggested that perceived usefulness have a significant influence on behavioural intention to use ICT for self-paced learning among undergraduates. Based on the obtained result, there was a significant influence of perceived usefulness on behavioural intention to use ICT among undergraduates ($\beta = 0.322$, $p < 0.001$) . Therefore, hypothesis nine is supported as postulated.

4.4.2.10 Hypothesis 10: Attitude toward Using ICT has a significant influence on Behavioural Intention to Use ICT

Tenth hypothesis in this study assumed that undergraduates' attitude towards using ICT had a significant influence on behavioural intention to use ICT for self-paced learning. Based on the findings of the study, significant influence of attitude towards using ICT was proven on behavioural intention to use ICT ($\beta = 0.455$, $p < 0.001$). Thus, the tenth hypothesis of this study is supported.

4.4.2.11 Hypothesis 11: Behavioural Intention to Use ICT has a significant influence on Actual ICT Use

Hypothesis eleven proposed that behavioural intention to use ICT has a significant influence on actual ICT use. From the result, there is a significant coefficient linking behavioural intention to use ICT to actual ICT use ($\beta = 0.314$, $p < 0.001$). Therefore, hypothesis eleven is supported.

4.4.3 Emergence of New Path

Addition to the 11 hypotheses proposed, a new path linking mastery and motivation (β = 0.361, p < 0.001) emerged from the revised model (Figure 4.22). The new addition path is included in the revised structural model together with significant and non-significant paths as depicted in Figure 4.23.

Table 4.33

Hypothesis Testing Summary for the Objective

Hypothesis	Path			P	Path Coefficient	Results
H1	Ms	→	PU	.708	.016	Not Supported
H2	Ms	→	PEOU	***	.474	Supported
H3	Mo	→	PU	***	.512	Supported
H4	SN	→	PU	.689	.012	Not Supported
H5	SN	→	BI	.048	.062	Supported
H6	PEOU	→	PU	***	.581	Supported
H7	PEOU	→	A	***	.307	Supported
H8	PU	→	A	***	.554	Supported
H9	PU	→	BI	***	.322	Supported
H10	A	→	BI	***	.455	Supported
H11	BI	→	IU	***	.314	Supported

S.E.: Standard Error of regression weights; C.R.: Critical Ration for regression weight; P: Level of Significance, ***p < .001
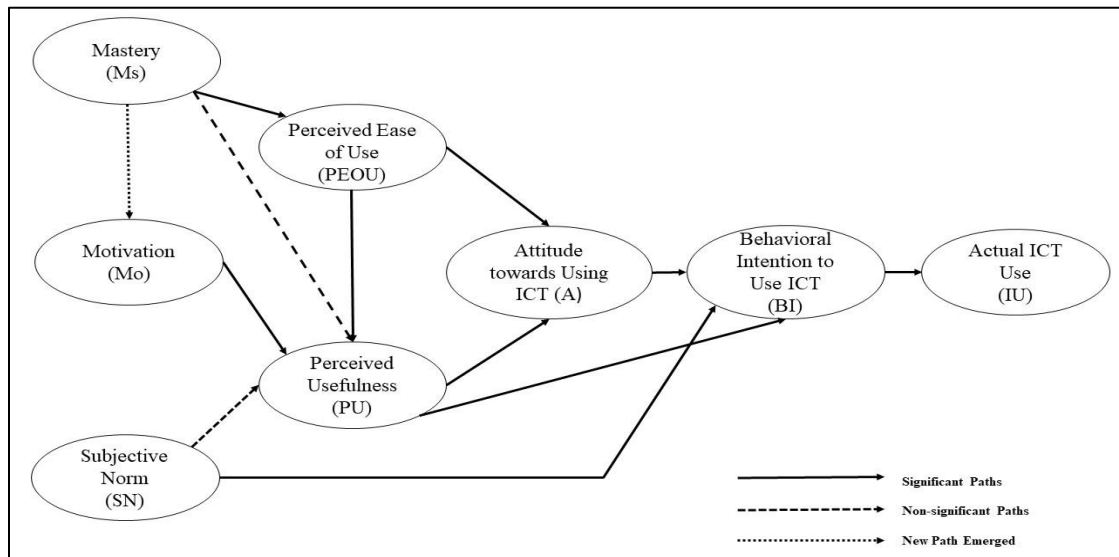

Figure 4.23. The Revised Structural Model with Significant and Non-significant Paths

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The revised structural model with non-significant paths were removed as lesser parameter paths being estimated in the model will give a parsimony fit. Although both model fit adequately, the parsimonious revised model was preferred as it showed a lower value of AIC (1468.795) than the earlier model (1584.553) (Figure 4.22), it indicates that a simpler model is better fitting and parsimonious than the earlier structural model. Following Figure 4.24 shows the standardized path estimates of the parsimonious revised structural model without measurement specification. Therefore, the parsimonious revised model is also considered as the final model of this study. The regression weights and the standard regression weight for the parsimonious revised structural model are shown in Figure 4.24 based on the result shown in the Table 4.34, all the path coefficients are now significant by the critical ration test ($> \pm 1.96$, $p < .05$).
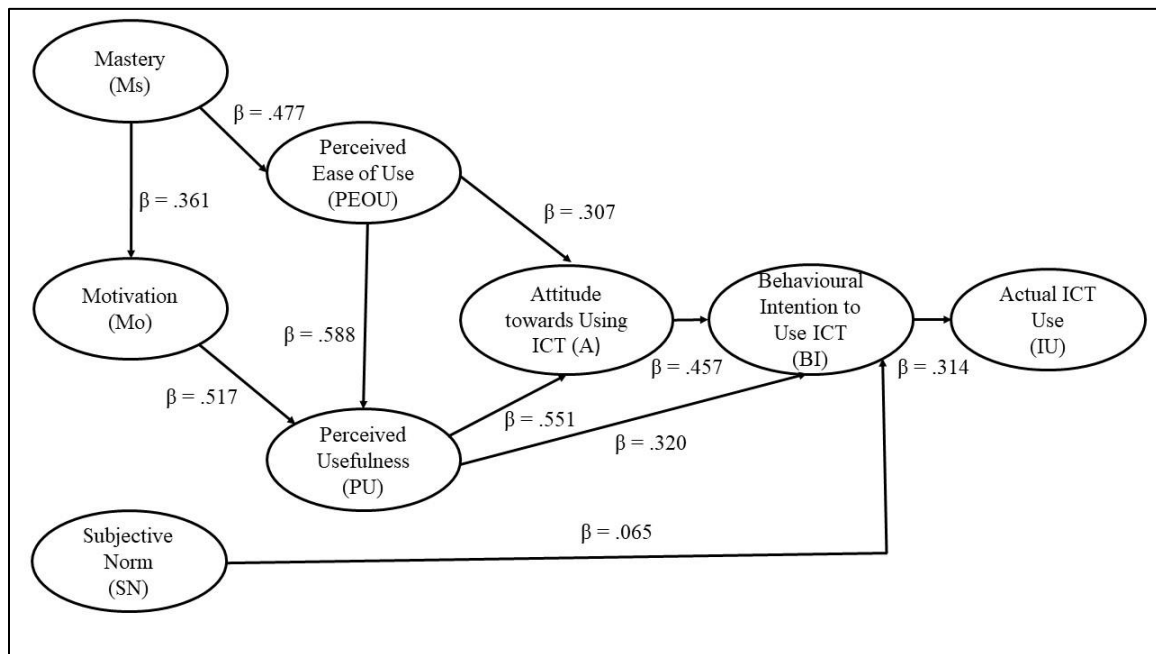

Figure 4.24. The Parsimonious Revised Structural Model

Table 4.34.

Regression Weight and Standardized Regression Weight for the Parsimonious

Revised Structural Model

Path			Estimate	S.E.	C.R.	P	Std. Estimate
Ms	→	PEOU	.636	.059	10.796	***	.477
Mo	→	PU	.649	.060	10.829	***	.517
SN	→	BI	.058	.028	2.077	.038	.065
PEOU	→	PU	.465	.034	13.788	***	.588
PEOU	→	A	.255	.045	5.623	***	.307
PU	→	A	.571	.062	9.272	***	.551
PU	→	BI	.389	.079	4.911	***	.320
A	→	BI	.537	.080	6.725	***	.457
BI	→	IU	.279	.038	7.392	***	.314

S.E.: Standard Error of regression weights; C.R.: Critical Ration for regression weight; P: Level of Significance, ***$p < .001$

Table 4.35 illustrates the value of the coefficients of determiner R^2 for all the five endogenous variables. In this model, 22.8% of the variances in PEOU was explained by Ms ($\beta = 0.477$, $p < 0.001$). Whereas the 73.8% of PU variance is jointly explained by Mo and PEOU. The biggest contributor to PU was by PEOU ($\beta = 0.588$, $p < 0.001$). The other factor namely Mo contributed ($\beta = 0.517$, $p < 0.001$). Besides, 63.8% variance of A was jointly explained by PU ($\beta = 0.551$, $p < 0.001$) and PEOU ($\beta = 0.307$, $p < 0.001$). Apart from this, more than half of the variance (53.9%) for BI was explained by three factors (PU, A, and SN) combined together. The major contributor of the three factors is A ($\beta = 0.457$, $p < 0.001$) followed by PU ($\beta = 0.320$, $p < 0.001$) and SN ($\beta = 0.065$, $p < 0.05$). For actual ICT use for self-paced learning, 9.8% of the variance was explained by BI ($\beta = 0.314$, $p < 0.001$).

Table 4.35

Explained Variances (Squared Multiple Correction, R²) for Parsimonious Revised Structural Model

Endogenous	Estimate (%)
PEOU	22.8
PU	73.8
A	63.8
BI	53.9
IU	9.8

CHAPTER 5

SUMMARY, DISCUSSION, CONCLUSION, IMPLICATIOS AND RECOMMENDATIONS FOR FUTURE RESEARCH

5.1 Introduction

In previous chapters of this study, it was outlined the introduction of the investigation, the review of literature, description of the research methodology, and the analysis of the finding from the obtained data. In this chapter, discussion of the hypotheses was done based on the research findings. The implications of the study for theoretical and practical perspectives are discussed in this chapter as well followed by discussion of some of the limitations of the study and recommendations for future research. As the final part of the study, a conclusion is presented.

5.2 Recapitulation of the Study

The study was designed to capture and determine the factors that influence students use of ICT for self-paced learning in tertiary education. The suggested factors were perceived ease of use, perceived usefulness, attitude towards use, behavioural intention to use, mastery, motivation, and subjective norm. This investigation was conducted to analyse the conceptual framework of the investigation on ICT use for self-paced learning among the undergraduates. The followings are the tested hypotheses of the study:

H1: Mastery has a significant influence on Perceived Usefulness.

H2: Mastery has a significant influence on Perceived Ease of Use.

H3: Motivation has a significant influence on Perceived Usefulness.

H4: Subjective Norm has a significant influence on Perceived Usefulness.

H5: Subjective Norm has a significant influence on Behavioural Intention to Use ICT.

H6: Perceived Ease of Use has a significant influence on Perceived Usefulness.

H7: Perceived Ease of Use has a significant influence on Attitude towards Using ICT.

H8: Perceived Usefulness has a significant influence on Attitude towards Using ICT.

H9: Perceived Usefulness has a significant influence on Behavioural Intention to Use ICT.

H10: Attitude toward Using ICT has a significant influence on Behavioural Intention to Use ICT.

H11: Behavioural Intention to Use ICT has a significant influence on Actual ICT Use for Self-Paced Learning.

This study was conducted among a sample of 853 respondents. The data was obtained through a questionnaire that was designed with statements that entails the predictors influencing the use of ICT for self-paced learning. The scale that was used in the questionnaire was a five point Likert-type. Pilot study was conducted before the actual employment of the questionnaire to the respondents. The reliability test was carry out on the pilot tested questionnaire, and the value yield from the test showed an acceptable internal reliability consistency and further alteration of the questionnaire was also done by the researcher in order to achieve a higher reliability reading. After the collection of the data, the SPSS and AMOS software were employed to analyses the data. SEM was used to investigate the linkage of predicators of ICT use for self-paced learning among the undergraduates by testing the model fit of the proposed model and the obtained data.

5.3 Discussion of the Study

In this section, a detailed discussion on the obtained finding in Chapter 4 are presented concerning the factors that maximise the use of ICT among undergraduates for self-paced learning. The investigated factors in this study were perceived ease of use, perceived

usefulness, attitude towards use, behavioural intention to use, mastery, motivation, and subjective norm.

5.3.1 Influential Factors That Maximise the Use of ICT for Self-paced Learning among Undergraduate Students

A total sample of 853 undergraduates were obtained and investigate to study the influence of the precursor of ICT use for self-paced learning among the undergraduates. The resulting model from the study is an adequate fit to investigate the variables that are implicated as the model explained the undergraduates' use of ICT for self-paced learning through the eight constructs namely; mastery, motivation, subjective norm, perceived ease of use, perceived usefulness, attitude towards using ICT, behavioural intention to use, and actual use. In addition, nine out of the eleven hypothesis were supported in this study. The hypothesis findings are discussed in the following section.

5.3.2 Review of Findings

5.3.2.1 Research Question 1: Does Mastery has significant influence on Perceived Usefulness?

In this study, the researcher formulated a hypothesis stating that mastery have a significant influence on perceived usefulness, however, the hypothesis was not supported in this study. This finding was not parallel to the findings made by Oluwatobi, and Yemisi (2014) and Boe (2016) which they have found that mastery has direct influence towards perceived usefulness. In term of education context, mastery having no influence over perceived usefulness is possible as the students find that ICT mastery is not a major obstacle, however, the major hurdle for them to maximise their ICT use for self-paced learning is their own belief in using the appropriate and necessary ICT tools. Therefore, the finding

points out that those students who have regularly practiced to use ICT will automatically utilise ICT in their learning process, however their own feeling of worthiness will be the ultimate determiner in deciding to maximise the ICT usage for their self-paced learning over their competence of ICT usage. Moreover, this relationship is still relatively scant in pervious empirical studies; the influence of mastery on perceived usefulness needs to be further study to indicate that mastery can prove a clearer picture of its influence on perceived usefulness.

5.3.2.2 Research Question 2: Does Mastery has significant influence on Perceived Ease of Use?

As for this study, mastery had direct influence on perceived ease of use similar to the findings of Cheng (2011), Rym, Olfa, and Melika (2013), Oluwatobi and Yemisi (2014). This implies that students viewed that, if they have the competence in using ICT for self-paced learning, they will use it and on contrary, having less mastery of ICT will only hinder them form using it as they regard them as a complex tool to assist them in learning. In a study done by Oluwatobi and Yemisi (2014), the findings from the study indicate that most students were not satisfied with their ICT skills, thus it resulted in their non-use of technology to access the already available resources for their studies. ICT competence should be seen as critical factor in the integration of ICT in educational sector (Oluwatobi & Yemisi, 2014).

5.3.2.3 Research Question 3: Does Motivation has significant influence on Perceived Usefulness?

Bousbahi and Alrazgan (2015) reported motivation to influence perceived usefulness of technology among the participants of their study. The finding of this study revealed that students are motivated to use ICT for self-paced learning, as they are able to utilize ICT to

do assignments, researches, and revisions that leads them willing to maximise their ICT use to engage in self-paced learning context. Furthermore, motivation in a student plays a vital role when it comes to learning. Students believe that ICT can help them in search of better learning resources to achieve their learning goals. Thus, resulting in the increase of motivation stance and creating an eagerness inside the students to complete a given task. Upon completing their task, with the maximum use of ICT, students' quality of work is improved and without doubt the students will be more independent through self-paced learning since the students use ICT without any external support from the lecturer. Thus, resulting in the students' motivation influencing the perceived usefulness of ICT.

5.3.2.4 Research Question 4: Does Subjective Norm has significant influence on Perceived Usefulness?

Punnoose (2012), Motagian, Hassanzadeh, and Moghadam (2013), Attuquayefio, Achampong, and Aryeetey (2014), Teo and Zhou (2014), Layla (2017), and Mokhtar, Katan, and Hidayat-ur-Rehman (2018) found that subjective norm influenced perceived usefulness. However, in this study, it was found that subjective norm did not influence perceived usefulness. From the finding, it shows that the students were not fully convinced by their peers, lecturers and family members when they are considering usefulness of ICT in their studies. In other words, in view of higher education students, they placed utmost importance on matching ICT usefulness with their learning activities rather than confirming first to the norms and views of their significant others to utilize ICT in their self-paced learning at the individualistic level.

5.3.2.5 Research Question 5: Does Subjective Norm has significant influence on Behavioral Intention to Use ICT?

In this study, subjective norm was proven to have a significant influence on behavioural intention to use ICT for self-paced learning among the undergraduate students. Several other studies conducted (Devaraj, Easley, & Crant, 2008; Punnoose, 2012; Huang, Hsiao, Tang, & Lien, 2014; Attuquayefio, Achampong, & Aryeetey, 2014; Hon & Ho, 2015; Al Haderi & Aziz, 2015; Al- Ghaith, 2016) were also found to be parallel with this study's finding. The aforementioned studies have found proof that subjective norm have a significant influence on behavioural intention to utilize technology when it comes to students' learning process. Moreover, the finding further suggest that undergraduate students' intention to use ICT for self-paced learning will be directly influenced by their significant others such as peers, lecturers, and parents. Therefore, students who see themselves as a part of the community or an organization, it can be said that encouragement from these significant others are important for students to be engaged in using ICT for self-paced learning. It is possible for this study to yield such results for the variable subjective norm due to that the students in this study are surrounded by group of people who utilize ICT in daily basis. This might directly have encouraged them to use ICT for their self-paced learning in a formal and regulated environment as such as in their learning compound to fit into the norms that is found around them. In addition, since the students are influenced by their lecturers to use ICT in their learning process, the lecturers may constantly utter the advantages of using ICT for self-paced learning formally or informally to motivate students to use it to the maximum level possible.

5.3.2.6 Research Question 6: Does Perceived Ease of Use has significant influence on Perceived Usefulness?

In this investigation, perceived ease of use influenced perceive usefulness. This finding is similar to the results of past studies conducted (Moses, Wong, Bakar, & Mahmud, 2011; Godoe & Johamsen, 2012; Al-Adwan, Al-Adwan, & Smedley, 2013; Fathema, Shannon, & Ross, 2015; Nagy, 2017; Al-Azawei, Parslow & Lundqvist, 2017; Yang & Kwok, 2017 Sivo, Ku & Acharya, 2018), and it is parallel with TAM theory as well (Davis, Bagozzi, & Warshaw, 1989). The respondents who participated in this study possibly use ICT for self-paced learning when they perceive they use ICT with little effort or easily. Quite the opposite will happen if the students perceive ICT a complex tool to use. Thus, the students will less likely to maximise their ICT use in their self-paced learning process. This result validates the point that perceived ease of use and perceived usefulness are strongly related to each other when it comes to understanding acceptance behaviour of students towards ICT.

5.3.2.7 Research Question 7: Does Perceived Ease of Use has significant influence on Attitude towards Using ICT?

The study revealed that attitude towards using ICT was influenced by perceived ease of use. This result was parallel to studies conducted by Albirini (2006), Wong and Teo (2009), Al-Mushasha (2013), Alharbi and Drew (2014), John (2015), Fathema, Shannon and Ross (2015), Nagy (2017), Al-Azawei, Parslow and Lundqvist (2017), Yang and Kwok, (2017), and Sivo, Ku and Acharya (2018). Frequently, attitude indicates a certain degree of likelihood of adopting certain behaviours (Bertea, 2010). In regards with maximising ICT usage for self-paced learning, the finding shows a favourable and positive attitude of students as it can be seen that there is a relationship between perceived ease of use and

attitude towards using ICT. This finding suggest that there is a greater probability that the students will maximize their current ICT use for self-paced learning when they identify with the easiness of ICT usage in their self-paced learning process, thus, resulting in a positive outlook attitude towards utilizing ICT. It means that the students' attitude depends on the evaluation of whether it is difficult to use ICT for self-paced learning.

5.3.2.8 Research Question 8: Does Perceived Usefulness has significant influence on Attitude towards Using ICT?

The respondents in this study understand the significant of ICT usefulness when it applies to their self-paced learning process, thus resulting in a positive attitude to use it and contributing to their behavioural intention directly. This is correspondence to the findings done by Albirini (2006), Wong and Teo (2009), Moses, Wong, Bakar, and Mahmud, (2011), Lai, Wang, and Lei (2012), Al-Mushasha (2013), Alharbi and Drew (2014), and Zogheib and RAbaa'i (2015), Fathema, Shannon, and Ross (2015), Abdullah, Ward, and Ahmed (2016), Alalwan, Rana, Algharabat, and Tarhini (2016), Masa'deh, Tarhini, Mohammed, and Maqableh (2016), Nagy (2017), and Sivo, Ku, and Acharya (2018). The result demonstrated that students' use of ICT for self-paced learning can be maximised if they perceive ICT to be useful to them to support their educational needs. Almost certainly, students welcomed the use of ICT as a part of their self-paced learning process. Thus, the effect of the perceived usefulness construct on attitude can be explained by students' feeling of worthiness in using ICT as an useful technological tool that enhance their belief in using ICT for self-paced learning.

5.3.2.9 Research Question 9: Does Perceived Usefulness has significant influence on Behavioral Intention to Use ICT?

From the conducted investigation, a direct influence of perceived usefulness on behavioural intention to use ICT was proven and this was consistent with the study carried out by Punnoose (2012), Fathema, Shannon, and Ross (2015), Abdullah, Ward, and Ahmed (2016), and Al-Gahtani (2016), Nagy (2017), Al-Azawei, Parslow and Lundqvist, (2017), and Budu, Yinping, and Mireku (2018). Majority of studies conducted using TAM model, this is a salient result that can be concluded and the researchers agree that perceived usefulness has a direct effect towards behavioural intention towards use. This signifies that PU is a strong component of students' intention to utilise ICT for self-paced learning. To be exact, if students find that ICT is useful, they are more likely to utilise ICT as an approach for their self-paced learning.

5.3.2.10 Research Question 10: Does Attitude toward Using has significant influence on Behavioral Intention to Use ICT?

Attitude towards using ICT of the students was shown to have a significant direct influence on behavioural intention of students to the use ICT for self-paced learning. It can be also said that the undergraduates had a positive attitude towards using ICT for self-paced learning for their learning process. This finding was supported by few studies (Teo & Schaik, 2012; Guritno & Siringoringo, 2013; Fathema, Shannon, & Ross, 2015; Sivo, Ku & Acharya, 2018) which suggested that attitude towards using ICT had direct influence on behavioural intention to use it. Therefore, the higher the degree of attitude towards using ICT, the greater the chances of it affecting the behavioural intention to use ICT for self-paced learning among the undergraduates.

5.3.2.11 Research Question 11: Does Behavioral Intention to Use ICT has significant influence on Actual ICT Use for Self-paced Learning?

According to Ajzen and Fishbein (2005), a learners' behavioural intention to use a technology leads to the actual usage of the expertise as behavioural intention is a constant among various models that has been researched upon in past literatures. The analysis in this study showed that behavioral intention has an influence on actual use. As behavioral intention have influence over actual use, the students usage of ICT in self-paced learning are statistically reflected in their actual use of ICT for their learning process. Apart from that, behavioral intention is the immediate antecedent of actual usage behaviour and an indicator on the readiness of an individual to perform a specific behaviour (Tarhini, Elyas, Akour, & Al-Salti, 2016). These findings are also in congruence with those of Wang and Wang (2009), Phua, Wong, and Abu (2012), Alharbi and Drew (2014), Chatanash, and Miaji (2014), Fathema, Shannon, and Ross (2015), Abdullah, Ward, and Ahmed (2016), and Sivo, Ku & Acharya (2018).

5.3.2.12 Newly Emerged Path

In the finalised model, a new statistically significant path was discovered. This new path have contributed to the current knowledge of Technology Acceptance Model and in the educational technology field as very few studies vaguely mentioned the existence of this path however was not fully established or acknowledged. The path is mastery predicting motivation ($\beta = 0.361$).This means that the undergraduate students with adequate mastery of ICT use will most likely to be motivated to use ICT in self-paced learning. Similarly, when a person has the ability or competence to utilise ICT for their usage, they will be motivated to use it without much hesitant and they may be motivated to explore other online learning platforms that are available to further reinforce learning in their own time.

Salehi, Yunus, and Salehi (2012) did a similar theoretical extension. This particular study by Salehi, Yunus, and Salehi (2012) focused on motivation of teachers using ICT in their teaching and learning process for their classroom. The three authors concluded that ICT competency or the ability to use ICT for teaching and learning motivates them to utilise ICT in their endeavours. Another study done by Silviyanti and Yusuf (2015) stated that lack of ICT skills or competence would prompt the technology users to the non-use of ICT and with sufficient mastery of ICT skills, the technology users will be able to utilise ICT to the fullest in their teaching and learning process.

5.4 Implications of the Study

In this section, theoretical, practical and methodological implications of the present study are presented based on the results obtained from this present study.

5.4.1 Theoretical Implications

The findings of the study contributed significantly to the existing literature for several reason.

First, the model presented in this study have supported by the empirical results. All the ICT use orientations are directly and indirectly related to the eight factors (perceived usefulness, perceived ease of use, attitude towards use, behavioural intention to use, mastery, motivation, subjective norm, and actual use) used in this study for self-paced learning and the same holds for the relationship among TAM model and the proposed outcomes. Thus, it can be said that the model is relevant for self-paced learning in Malaysian context.

On top of that, the findings clearly show that variables in TAM such as perceived usefulness, perceived ease of use, and attitude towards using ICT continues to be significant factors of behavioral intention to use in the context of using ICT for self-paced

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learning among the Malaysian students. Moreover, the TAM model was expanded with three external variables namely, mastery, motivation, and subjective norm. The findings obtained through this study showed that the three variables complimented the TAM model. Moreover, the emergence of a new path allows future researchers to have in-depth investigation pertaining how mastery influences motivation in educational technology studies. Therefore, this study can be employed as an empirical study to examine ICT use for self-paced learning among the Malaysian students context. Thus, the findings of this study has contributed in closing the literature gap that has existed in finding a suitable model that examines the factors that leads to the maximum use of ICT for self-paced learning among the students in Malaysian tertiary education institutions.

Through this investigation, the model was expanded using additional exogenous variables, which were mastery, motivation, and subjective norm. Hence, the educators can consider the existing variables in TAM and the additional three exogenous variables when they advocate and encourage students to use ICT for self-paced learning, as they are significantly contributing factors in influencing the students' behaviour to maximise the use of ICT for self-paced learning.

Moreover, the applicability of TAM in Malaysian context was also tested in this study. As ICT is evolving in a rapid manner in various industries such as in education field, it is important to evaluate and understand new technology corporation into students' learning process and critically identify the potential that it can generate from the adoption of ICT for the students. TAM provides exactly the same framework for studying the prospective for commercializing technological for education purposes. A further deep dive into the attributes of TAM could also help in studying the relative importance of each construct in TAM and education strategies could be rationalized accordingly.

5.4.2 Practical Implications

The implications from this study not only provides significant benefits for individuals within the university that is investigated, but also to the universities in Malaysia governmental and other privatized universities as well as other neighbouring countries as they replicate this study to understand their students' behaviour in using ICT for self-paced learning.

As the education paradigms are rapidly moving towards technology, it is important for the government to recognise the importance of it and drawing policies that are in line with the trends in education. So that the students will no miss out on the valuable resources due to the fact that they are not able to maximise the use of technology for learning. From the primary stage of education, the students have to be exposed earlier to the basic operating skills of ICT, so that they are equipped with sufficient knowledge to have access to the wide and transparent data and information available in this millennium. The importance of ICT mastery among the students should be made into an awareness that it will definitely will be useful for them in future and make them to appreciate the need to be able to reach the information that they can have access to in a timely manner.

Apart from that, the educators needs to constantly encourage and motivate their students on the usefulness of ICT in their learning process and also outside of their formal learning process. The educators can construct pedagogies such as participatory design approach that will allow students promptly to use ICT outside of their classroom to analyse, comment upon, and complete certain tasks. Another example of encouraging students or generation Y and Z to participate in ICT for education purpose is the use of gamification. Game based learning can be another new pedagogy approach to attract student to use ICT for learning. There are variety of game based learning software such as Socrative and

Kahoot that have the potential to enhance learning. It is good to nurture the students to have a positive attitude towards using ICT as it is an easy, fun, and useful tool toward their learning process and should not be felt burden by using ICT.

Moreover, the tendency of students following their significant others, such as peers and lecturers can also assist in maximising their ICT use for self-paced learning as found in this study. Educators whom are up-to-date with current education applications and technologies can set as an example for their students to follow rather than being labelled as outdated. The significant others can also play a role in increasing the perception that using ICT for self-paced learning is rewarding and beneficial to students. Besides this, a student needs to have a positive attitude towards using ICT for self-paced learning as suggested by this study. The students themselves can cultivate their habit of using ICT for self-paced learning.

As ICT utilisation in classrooms by undergraduates are getting more prevalent as time evolves, this study provided a glimpse of the factors that influence undergraduates use ICT for self-paced learning. This study provides the body of stakeholders such as Ministry of Education, Ministry of Higher Education, Central Program Management, Malaysia Administrative Modernization and Management Planning Unit, Ministry of Science, Technology, and Information, and Malaysian Communications and Multimedia Commission in-charge of Malaysian education field to acknowledge the reason behind students' use of ICT when it comes to self-paced learning from the undergraduates' point of view and produce design interventions to aid the students in the tertiary level, which will lead to producing workforce that are technology savvy.

Apart from that, the universities should invest in researches such as this as it will provide an avenue for discovering students' learning process and at the same time to uphold

the institutional standards. Through such studies, it will allow universities to provide an institutional statement of its technology proficiency and technology integration via developing strategies to assess learning achievements as ICT are integrated into curriculum. Therefore, encouragement of utilising ICT for self-paced learning among the students can be done properly as this allows the policy makers and curriculum designers in the education ministry or educational institutions to design courses that can allow students to use ICT and connect immediately with other students without relying on the traditional method whenever the possibility of it arises as the Malaysian education system have moved from traditional setting to a modern and globalized stage.

5.4.3 Methodological Implications

The methodology used in this study can be used as a framework to carry out future research in this area of study. This is especially the case in the Malaysian government and privatised universities, including ways to approach surveying students in tertiary education institutions; questionnaire design; testing of discriminant validity and analysis of the proposed research model using SEM with AMOS.

The use of SEM with AMOS is highly endorsed to be used for model testing and generating a model compared to other statistical method as such in SPSS. According to Byrne (2010) and Awang (2015), using SEM with AMOS have several benefits. SEM presents itself well to the analysis of data for the purposes of inferential statics whereas other multivariate techniques are descriptive in nature which allows hypothesis resting possible but difficult to generate it. According to Byrne (2010), explicit estimates of error variance parameters can be shown in SEM compared to traditional multivariate techniques. With the estimates shown, it will be easier to assess and correct for measurement error.

Awang (2015) further added that SEM AMOS uses Maximum Likelihood Estimator (MLE) and able to produce the fitness indexes to assess the goodness of the model.

5.5 Limitations of the Study

Although this study has achieved few significant findings as drawn in the study's objective and contributed to the body of TAM theory literature and education technology field, there are few limitations identified with this investigation that needs to be addressed in future research.

The first limitation identified in this quantitative study is that the researcher did not include qualitative method such as interview to compliment it together with the self-administrated questionnaire approach. In order to obtain a genuine feedback from the undergraduates, some constraints can be introduced to the respondents with open-ended questions in the survey as this will give opportunity for the respondents to freely give opinions on the subject that there are being investigated.

Creswell (2015) mentioned quantitative and qualitative method have their own weaknesses. Quantitative research does not address personal feelings of the respondents; on the other hand, qualitative study does not address the general feel of larger population and cannot be generalized to a large group of people (Creswell, 2015). The researcher decided to use only quantitative research method as it applies and gives a more general view of the population compared to qualitative study, which is more towards individualistic feelings. Moreover, this study have used an established theory, which is widely used in the research field of education technology and proven to yield valid results. Therefore, it was sensible for the researcher to only use quantitative research method to explain the occurring phenomenon using statistics, which is more evident as there are numbers compared to

subjective viewpoints that can be interpreted wrongly from the original meaning of the respondents as the researcher might be biased towards the given viewpoint.

The second limitation identified with this study is that the factors used although the literature review done is comprehensive. It cannot be concluded that the literature review done on the selection of factors used in this study are either exhaustive or exclusive. Apart from these factors, there are possibilities that other facets or variables not conceptualized and used in this study. Apart from the abundant available variables, the used factors may also prone to change overtime after this study conducted. There might be other variables that are significant in explaining the use of ICT for self-paced learning that may not have been considered in this investigation. In order to explain more variance between the exogenous and endogenous variables, future studies needs to look at more variables that can be included in to explain more variance.

As a conclusion for limitation of study, aforementioned limitations do not invalidate the results nor there will not be a question of quality on the obtained data used for this study's analyses. Future researches should be conducted to address such limitations to ensure consistency of the findings.

5.6 Strengths of the Study

The study managed to obtain a new path, which were not established in previous studies. This finding have given a new perspective into the investigated variable of mastery and motivation as the result shows that with proper mastery of ICT skills, the students will be motivated to use ICT for self-paced learning. Furthermore, another strength of the study is that a clear documentation in this study was provided concerning the content and application of the survey instruments so that other researchers can evaluate the validity of the findings. With clear documentation and standardised approaches in this investigation,

it permits the study to be replicated with caution to different areas and contexts with the production of comparable findings.

5.7 Recommendation for Future Studies

To overcome the limitations that have occurred in this present study, future studies are needed. Hence, the researcher suggests several recommendations for future studies.

As this was a quantitative study, whereby a survey form was used to gather feedback from the undergraduates, which requires them to answer according to the stated statements. For future study, qualitative study can be included, as it will offer a more in-depth knowledge in relation with the factors that influence undergraduates use of ICT for self-paced learning. This is because qualitative study approach as such interview will allow the researcher to gauge the respondents' feelings and views which information that cannot be explained using statistical data. As this study revealed the new connection between mastery or competency and motivation, researchers in the field of educational technology can further extend on this particular relationship using the Competence Motivation Theory by Robert White (1959) and Susan Harter (1978). Therefore, future researchers can consider using the two sets of theory namely, Technology Acceptance Model and Competence Motivation Theory to triangulate quantitative and qualitative data to produce results that are more conclusive.

Moreover, future study can consider using the longitudinal approach in data collection as data is gathered repeated over a period of time. It will allow future researcher to use experimental design that can benefit them in understanding the related construct over some period of time. This approach can allow researcher to evaluate the changes that occur in the undergraduates' behaviour and attitude effectively as the same sample is followed over time.

Apart from that, a continuation of this research topic can be expand to other universities such as government and private universities around Malaysia to yield a better result that better fits the population as this current study have only focused on a private tertiary education establishment. Therefore, it is suggested future study to have diversified samples from different universities in Malaysia. This method of approach is expected to increase the generalisability and robustness of the study and at the same time, it allows the findings of this study to be applicable to a different context and setting.

5.8 Conclusion of the Study

Overall, this particular investigation explored the factors that maximises the undergraduates' use of ICT for their self-paced learning. In order to explore and clarify which factor is linked with the empirical research, this particular study followed a quantitative approach and used SEM to conduct the analysis. By using TAM as a base, the researcher developed the conceptual framework of the study and further added three exogenous factors (mastery, motivation and subjective norm) that can contribute to the model according to the past empirical studies.

From there, quantitative method of analyses were carried out in SPSS for preliminary analyses such as to detect missing data, outliers, normality issues, and to identify multicollinearity and afterwards, CFA was also carried out to prepare the screened data for AMOS SEM since it has been categorized as confirmatory purpose. By using CFA in SEM, the researcher achieved the required fitness index, reliability, and validity test to confirm the conceptual framework developed for this investigation.

The main objective of the research was to extend the TAM model and to identify the factors that maximise the use of ICT for self-paced learning among the undergraduates. Through this study, the findings showed that out of the eleven hypotheses, nine hypotheses

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were supported and the two remain hypotheses were not supported. Out of three exogenous variables used to extend the TAM model, only two variables (mastery and motivation) indirectly influenced the behavioural intention to use ICT for self-paced learning among the undergraduates whereas subjective norm directly influenced behavioural intention to use ICT for self-paced learning among the undergraduates. Practically, by understanding the students' motivation to use ICT in self-paced learning can assist the stakeholders to promote and encourage even more the use of ICT for self-paced learning among the undergraduates.

Besides that, this study validated TAM in the viewpoint of using ICT for self-paced learning among undergraduates. The findings clearly suggested that the traditional endogenous variables in TAM such as perceived usefulness, perceived ease of use, and attitude towards using ICT continue to be significant and contributing factors of actual ICT use for self-paced learning. The model explained a significant portion of the variance (53.9%) in behavioural intention to use ICT for self-paced learning and a small portion of the variance (9.8%) in actual use.

Moreover, the majority of the final findings obtained through this investigation were similar with other TAM studies that investigated ICT use among students in the learning process. The three fundamental factors (perceived ease of use, perceived usefulness, and attitude towards use) investigated in this study were also reaffirmed in studying the ICT use for self-paced learning among the undergraduates. Said that, this study has added some valuable insight into the existing TAM theory, literature, and increased the body of knowledge for self-paced learning in Malaysian context of study.

Apart from that, the new and unique established finding, the new path linking mastery to motivation shares some insight to the researched topic as it was not established in past literatures or researched model used. The path can be incorporated into the TAM

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model literature as the external factors to be used as it can predict statistically significant measurement of behavioural intention to use ICT. It allows the curriculum designers to look into the available avenues before incorporating ICT into learning process which will eventually encourage students to maximise their ICT usage further. Since institutions are moving away from traditional methods of teaching and learning, it have accelerated ICT advancement within higher education through research. New findings in this research will prompt university to act as incubators for all students, faculty, and staff to make new findings and create solutions to meet the requirements of real-world challenges as engraved in the university's vision.

As a conclusion, by knowing the students' perspective when it comes to ICT usage for self-paced learning, this study offers the research community with theoretical, practical and methodological insights on how students are triggered to use ICT in their self-paced learning environment. As such, all the findings obtained in this study would help those in decision-making positions to formulate solutions and strategies that can further enhance students' learning using ICT in order to be in line with the current education policy drawn by the government, which promotes globalisation learning among its citizens. This is also to cope with the intense development and demand of education sector with the growth of ICT.

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Appendix 1

RESEARCH INSTRUMENT

Maximising Information and Communication Technology (ICT) Usage for Self-paced Learning among UTAR Undergraduates

Survey Questionnaire

Dear respondent,

I am a postgraduate student from Faculty of Arts and Social Sciences, Universiti Tunku Abdul Rahman (UTAR), Malaysia. I would like to kindly invite you to be part of a research study by completing the survey. This current research focus on the usage of ICT for self-paced learning among UTAR students. In the context of this study:

Self-paced Learning
Is an approach of content delivery that attempts to give students the ability to progress through materials at their own speed rate rather that a rate determined by the teacher (Magil, 2008)

Your name and any of the information you have provided will be kept strictly confidential. All responses will be stored in a secure environment. The results obtained for this study would be used for academic purposes only. In order for the results of this survey to truly represent your view, it is important that you fully complete the enclosed questionnaire. Your responses to this survey is very important in providing valuable information for the research study.

Please note that this survey completely voluntary and should you feel any sort of discomfort upon completion or prior to completion, you may stop answering the questions without any prior notice. This research survey will require about 10 minutes to complete.

Thank you for your valuable time you spent on answering these questions.

Yours sincerely,
Tan Jian Heng

Section A
Please place a tick "✓" or write your responses where necessary for each of the following:

1. Gender:
☐ Male
☐ Female

2. Age:
_____

3. Name of your Faculty:
☐ Faculty of Science
☐ Faculty of Creative Industries
☐ Faculty of Business and Finance
☐ Faculty of Arts and Social Sciences
☐ Faculty of Medicine and Health Sciences
☐ Faculty of Accountancy and Management
☐ Faculty of Engineering and Green Technology
☐ Lee Kong Chian Faculty of Engineering and Science
☐ Faculty of Information and Communication Technology

4. Do you use ICT for self-paced learning?
☐ Yes
☐ No

5. I use ICT for self-paced learning purposes on a weekly basis:
Indication ' > ' = more than; ' < ' = less than
☐ Never
☐ > 30 minutes < 2 hour
☐ > 2 hours < 4 hours
☐ > 4 hours < 6 hours
☐ > 6 hours

Section B

Please place a tick "✓" that best represent your option in the relevant column for each statement below.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Perceived Usefulness

No	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
PU1	I would find ICT useful in my self-paced learning process.					
PU2	The use of ICT enables me to increase productivity in self-paced learning.					
PU3	Using ICT improves my study performances.					
PU4	ICT gives me a greater control over my self-paced learning.					
PU5	I find ICT a useful tool for my self-paced learning in my course of study.					
PU6	Using ICT enhances the effectiveness of my self-paced learning process.					
PU7	Overall, I find ICT to be advantageous for my self-paced learning.					

Perceived Ease of Use

No	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
PEOU1	Learning to use ICT for self-paced learning is easy for me.					
PEOU2	I find it easy to obtain materials using ICT for my self-paced learning.					
PEOU3	My interaction with ICT is clear for self-paced learning.					
PEOU4	My interaction with ICT is understandable for self-paced learning.					
PEOU5	It is easy for me to become skilful at using ICT for self-paced learning.					

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
PEOU6	Overall, I find that ICT is easy to use for my self-paced learning.					

Attitude towards using ICT

No	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A1	ICT is an important source to maintain my interest in achieving my learning goals through self-paced learning.					
A2	ICT is an important tool to maintain my interest in achieving my learning goals through self-paced learning.					
A3	I feel that using ICT for my self-paced learning is a good idea.					
A4	I have a generally favourable attitude towards using ICT for my self-paced learning.					
A5	I feel that using ICT makes self-paced learning more interesting.					
A6	I feel better using ICT for self-paced learning as it provides better access.					

Behavioural Intention to Use

No	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
BI1	I have the intention to use ICT for my self-paced learning in near future.					
BI2	I predict that I would be using ICT in my self-paced learning in near future.					
BI3	I plan to use ICT for my self-paced learning in near future.					
BI4	I have the intention to learn more about using ICT for my self-paced learning in near future.					

Mastery

How would you rate your mastery level in terms of using the following ICT skills for self-paced learning?

No	Questions	Very Unconfident	Not Confident	Unsure	Confident	Very Confident
Ms1	Basic of operating Personal Computer (using keyboard, mouse, etc.)					
Ms2	Managing files					
Ms3	Using word processor					
Ms4	Using spreadsheet processor					
Ms5	Creating and designing presentation					
Ms6	Internet browsing					
Ms7	Searching for information using the internet					
Ms8	Downloading files from the internet					
Ms9	Using emails					
Ms10	Using WBLE					
Ms11	Using social media					
Ms12	Accessing YouTube					

Motivation

No	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Mo1	I believe ICT can help me continue in reaching my ultimate goals in learning through self-paced learning.					
Mo2	I believe that ICT can help me to achieve my learning goals quickly through self-paced learning.					
Mo3	I believe that ICT can help me to achieve my learning goals efficiently through self-paced learning.					
Mo4	I believe that ICT can help me in search for better learning resources to achieve my learning goals (e.g. UTAR OPAC, e-journals, e-learning)					
Mo5	I believe ICT can help me to search for more opportunities to achieve my learning goals.					
Mo6	The thought of using ICT for self-paced learning is exciting for me.					
Mo7	Self-paced learning through ICT motivates me in my tertiary education process.					

Subjective Norm

No	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
SN1	Lecturers think that I should use ICT for my self-paced learning process.					
SN2	My peers think that I should use ICT for my self-paced learning process.					
SN3	My parents think I should use ICT for my self-paced learning process.					
SN4	I would do what my lecturer thinks I should do.					
SN5	I would do what my peers think I should do.					

SN6	I would do what my parents think I should do.					

Section C

Actual ICT Usage
How would you rate your ICT usage for self-paced learning?

No	Questions	Never or almost never	Several times a year	Several times a month	Several times a week	Everyday or almost everyday
IU1	I do my assignments using ICT					
IU2	I search the internet for information for my assignments					
IU3	I email lecturer(s)					
IU4	I download, upload or browse learning materials on my university's website					
IU5	I use online dictionaries or encyclopaedia					
IU6	I search different sources online for learning a particular topic that I am interested in					
IU7	I learn with educational software, games or quizzes					

Thank you very much for spending your valuable time to answer the questions!

Appendix 2 – Appendix 3

INVITATION OF PANELS

UNIVERSITI TUNKU ABDUL RAHMAN
Wholly Owned by UTAR Education Foundation (Company No. 578227-M)

Ms Er Pek Hoon
Department of International Business
Faculty of Accountancy and Management
Universiti Tunku Abdul Rahman
Jalan Sungai Long,
Bandar Sungai Long, Cheras
43000, Kajang,
Selangor, Malaysia

Dear Miss Er,

INVITATION TO BE PANEL OF INSTRUMENT VALIDATION

Greetings!

In response to the subject above, I would like to kindly invite you to be the panel of instrument validation of my Master supervisee, Tan Jian Heng.

Field of study : *Educational Technology*
Research title : *Maximise Information and Communication Technology (ICT) Usage for Self-Paced Learning among UTAR Undergraduates*

In concern with this, attached document is the relevant questionnaire of the study.

Your guidance and advice in improving the research quality and development are highly appreciated.

Thank you very much and I look forward to hearing from you soon.

Best regards,

....
Assistant Professor Dr. Priscilla Moses
Faculty of Creative Industries
Universiti Tunku Abdul Rahman
Jalan Sungai Long,
Bandar Sungai Long, Cheras
43000, Kajang,
Selangor, Malaysia

Address: No.9, Jalan Bersatu 13/4, 46200 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Postal Address: P O Box 11384, 50744 Kuala Lumpur, Malaysia.
Tel: (603) 7958 2628   **Fax:** (603) 7956 1923   **Homepage:** http://www.utar.edu.my

UNIVERSITI TUNKU ABDUL RAHMAN
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Assistant Professor Dr Mahmud Bin Hj Abd Wahab
Deputy Dean (R&D and Postgraduate Programmes)
Department of Finance
Faculty of Business and Finance
Universiti Tunku Abdul Rahman
Jalan Universiti, Bandar Barat
31900 Kampar
Perak, Malaysia

Dear Assistant Professor Dr Mahmud,

INVITATION TO BE PANEL OF INSTRUMENT VALIDATION

Greetings!

In response to the subject above, I would like to kindly invite you to be the panel of instrument validation of my Master supervisee, Tan Jian Heng.

Field of study   : *Educational Technology*
Research title   : *Maximise Information and Communication Technology (ICT) Usage for Self-Paced Learning among UTAR Undergraduates*

In concern with this, attached document is the relevant questionnaire of the study.

Your guidance and advice in improving the research quality and development are highly appreciated.

Thank you very much and I look forward to hearing from you soon.

Best regards,

Assistant Professor Dr. Priscilla Moses
Faculty of Creative Industries
Universiti Tunku Abdul Rahman
Jalan Sungai Long,
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Address: No.9, Jalan Bersatu 13/4, 46200 Petaling Jaya, Selangor Darul Ehsan, Malaysia
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Appendix 4 – Appendix 5

CONSENT AND PERSONAL DATA PROTECTION STATEMENT FORMS

Maximizing ICT Usage for Self-paced Learning among UTAR Undergraduates

CONSENT FORM

Greetings!
This study is designed solely for research purposes and you are cordially invited to participate in this research project to explore the use of ICT for self-paced learning by extending the Technology Acceptance Model (TAM) model.

Confidentiality:

This research study is solely designed for research purpose and no one except the researchers will have access to any of your responses. All information and responses you provide in this research will be protected and will not be made available to the public unless disclosure is required by law in accordance with Personal Data Protection Act 2010.

Disclosure:

Data and information obtained from this study will not identify you individually although the data and information may be given to the sponsor and/or regulatory authorities. The data and information may be published or be reused for research purposes not detailed within this consent form. The original records will be reviewed by the principal investigator and the research team, the UTAR Scientific and Ethical Review Committee, the sponsor and regulatory authorities for the purpose of verifying research procedures and/or data.

Voluntary Participation:

There is no other penalty or loss of benefits for participation. If you decide not to participate, you may subsequently change your mind about being in the study, and may stop participating at any time. There is no anticipated risks associated with participation.

By signing this consent form, you authorize the record review, publication and re-utilisation of data and information storage, and data transfer as described above.

Declaration:

I have read or have the information above read to me, in the language understandable to me. The above content has been fully explained to me. I have asked all questions that I need to know about the study and this form. All my questions have been answered. I have read, or have had read to me, all pages of this consent form and the risks described. I voluntarily consent and offer to take part in this study. By signing this consent form, I certify that all information I have given is true and correct to the best of my knowledge. **I will not hold UTAR or the research team responsible for any consequences and/or liability whatsoever arising from my participation in this study.**

Consent:

If you wish to participate in this study, kindly sign below.

Signature of Participant		IC Number	
Telephone/HP Number		Date	

Statement:

I have fully explained to the participant taking part in this study what he/she can expect by virtue of his/her participation. The participant who is giving consent to take part in this study understands the language that I have used, reads well enough to understand this form, or is able to hear and understand the contents of the form when read to him or her.

To the best of my knowledge, when the participant signed this form, he/she understands:
- That taking part in the study is voluntary
- What the study is about
- What needs to be done
- What are the potential benefits

Signature of the Researcher		IC Number	
Name of the Researcher		Date	

PERSONAL DATA PROTECTION STATEMENT

Please be informed that in accordance with Personal Data Protection Act 2010 ("PDPA") which came into force on 15 November 2013, Universiti Tunku Abdul Rahman ("UTAR") is hereby bound to make notice and require consent in relation to collection, recording, storage, usage and retention of personal information.

Notice:
1. The purposes for which your personal data may be used are inclusive but not limited to:-
   - For assessment of any application to UTAR
   - For processing any benefits and services
   - For communication purposes
   - For advertorial and news
   - For general administration and record purposes
   - For enhancing the value of education
   - For educational and related purposes consequential to UTAR
   - For the purpose of our corporate governance
   - For consideration as a guarantor for UTAR staff/ student applying for his/her scholarship/ study loan

2. Your personal data may be transferred and/or disclosed to third party and/or UTAR collaborative partners including but not limited to the respective and appointed outsourcing agents for purpose of fulfilling our obligations to you in respect of the purposes and all such other purposes that are related to the purposes and also in providing integrated services, maintaining and storing records. Your data may be shared when required by laws and when disclosure is necessary to comply with applicable laws.

3. Any personal information retained by UTAR shall be destroyed and/or deleted in accordance with our retention policy applicable for us in the event such information is no longer required.

4. UTAR is committed in ensuring the confidentiality, protection, security and accuracy of your personal information made available to us and it has been our ongoing strict policy to ensure that your personal information is accurate, complete, not misleading and updated. UTAR would also ensure that your personal data shall not be used for political and commercial purposes.

Consent:
1. By submitting this form you hereby authorise and consent to us processing (including disclosing) your personal data and any updates of your information, for the purposes and/or for any other purposes related to the purpose.

2. If you do not consent or subsequently withdraw your consent to the processing and disclosure of your personal data, UTAR will not be able to fulfill our obligations or to contact you or to assist you in respect of the purposes and/or for any other purposes related to the purpose.

3. You may access and update your personal data by writing to us at _____.

Acknowledgment of Notice

[   ] I have been notified by you and that I hereby understood, consented and agreed per UTAR above notice.

[   ] I disagree, my personal data will not be processed.

…………………………
Name:
Date:

Appendix 6

ETHICAL APPROVAL LETTER

UNIVERSITI TUNKU ABDUL RAHMAN
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Re: U/SERC/54/2016

21 July 2016

Dr Priscilla a/p Moses
Department of General Studies
Faculty of Creative Industries
Universiti Tunku Abdul Rahman
Jalan Sungai Long
Bandar Sungai Long
43000 Kajang
Selangor

Dear Dr Priscilla,

Ethical Approval For Research Project/Protocol

We refer to your application dated 15 July 2016 for ethical approval for your research project and are pleased to inform you that your application has been approved under <u>expedited review</u>.

The details of your research project are as follows:

Research Title	Modelling Technology Acceptance: Maximise the Use of ICT for Self-Paced Learning Among UTAR Students
Investigator(s)	Dr Priscilla a/p Moses (PI) Dr Cheah Phaik Kin Ms Winnie Er Pek Hoon
Research Area	Social Sciences
Research Location	UTAR (Sungai Long & Kampar)
No of Participants	900 UTAR undergraduates (Age: 18 - 30)
Research Costs	UTAR Research Fund
Approval Validity	21 July 2016 - 20 July 2017

The conduct of this research is subject to the following:

(1)   The participants' informed consent be obtained prior to the commencement of the research,

(2)   Confidentiality of participants' personal data must be maintained; and

(3)   Compliance with procedures set out in related policies of UTAR such as the UTAR Research Ethics and Code of Conduct, Code of Practice for Research Involving Humans and other related policies/guidelines.

Should you collect personal data of participants in your study, please have the participants sign the attached Personal Data Protection Statement for your records.

The University wishes you all the best in your research.

Thank you.

Yours sincerely,

Professor Ir Dr Lee Sze Wei
Chairman
UTAR Scientific and Ethical Review Committee

c.c   Dean, Faculty of Creative Industries
        Director, Institute of Postgraduate Studies and Research

Appendix 7 – Appendix 9

DATA

OUTLIERS
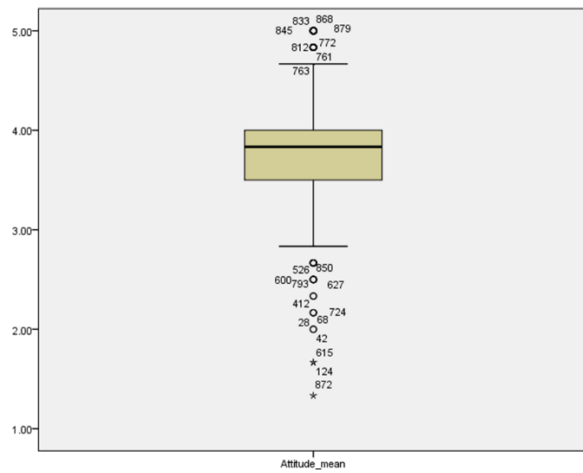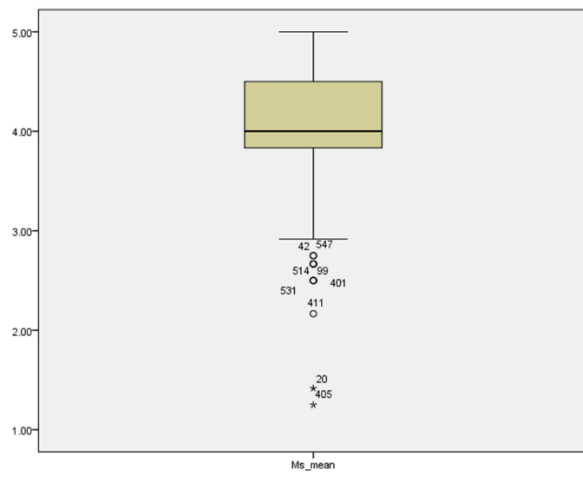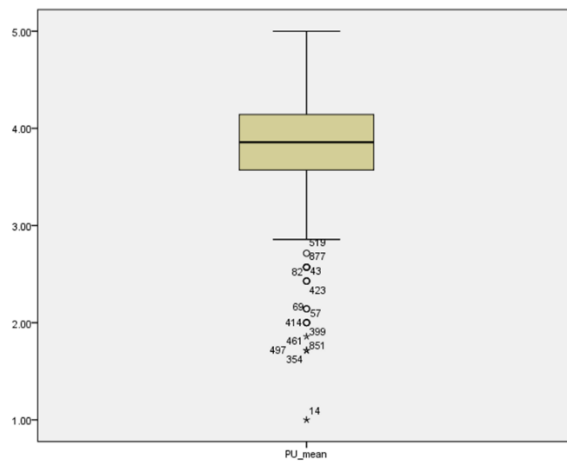
Normality Test

Perceived Usefulness

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PU_mean	.112	853	.000	.979	853	.000

a. Lilliefors Significance Correction
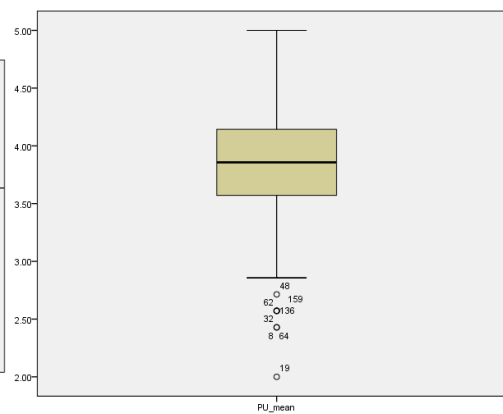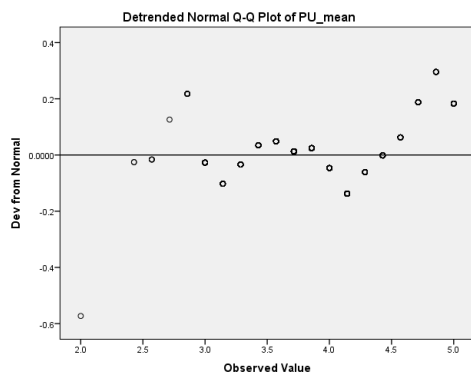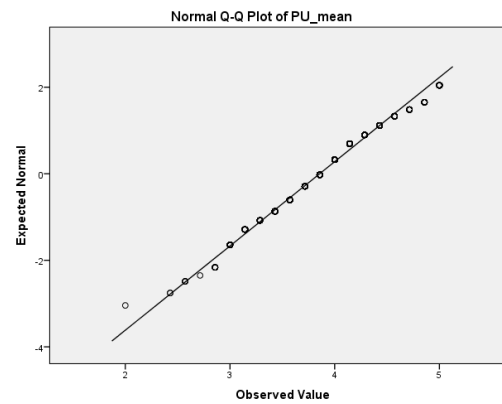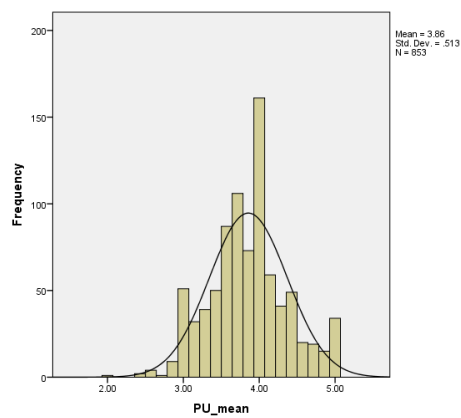
Perceived Ease of Use

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PEOU_mean	.083	853	.000	.985	853	.000

a. Lilliefors Significance Correction
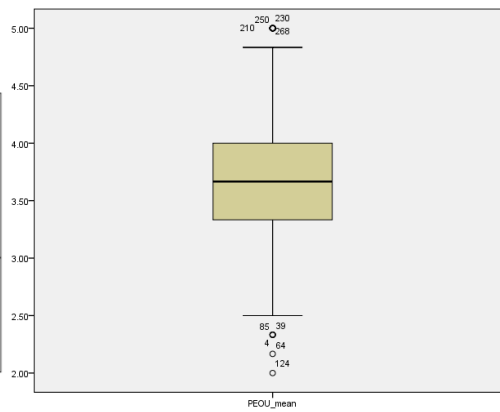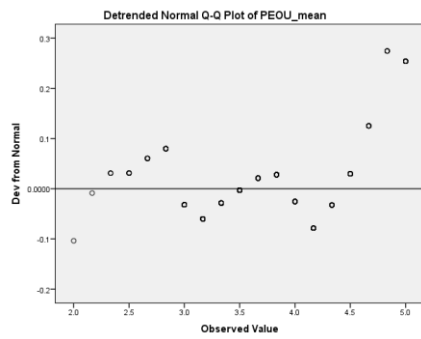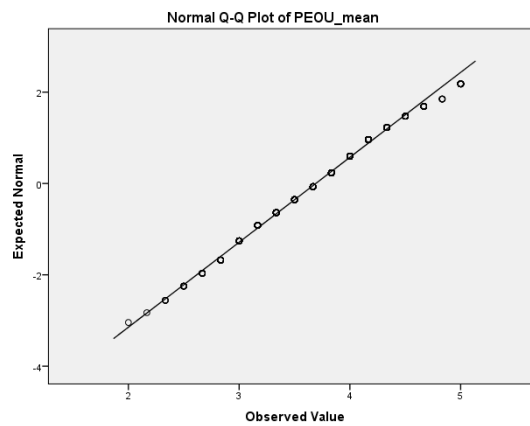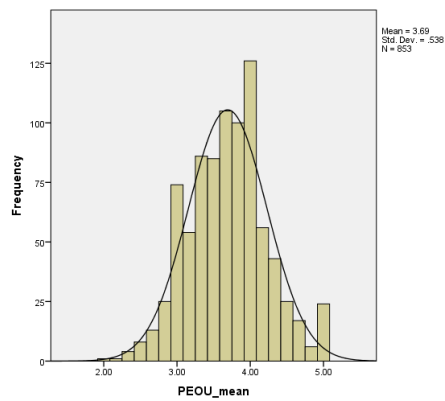
Attitude towards Using ICT

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Attitude_mean	.111	853	.000	.980	853	.000

a. Lilliefors Significance Correction
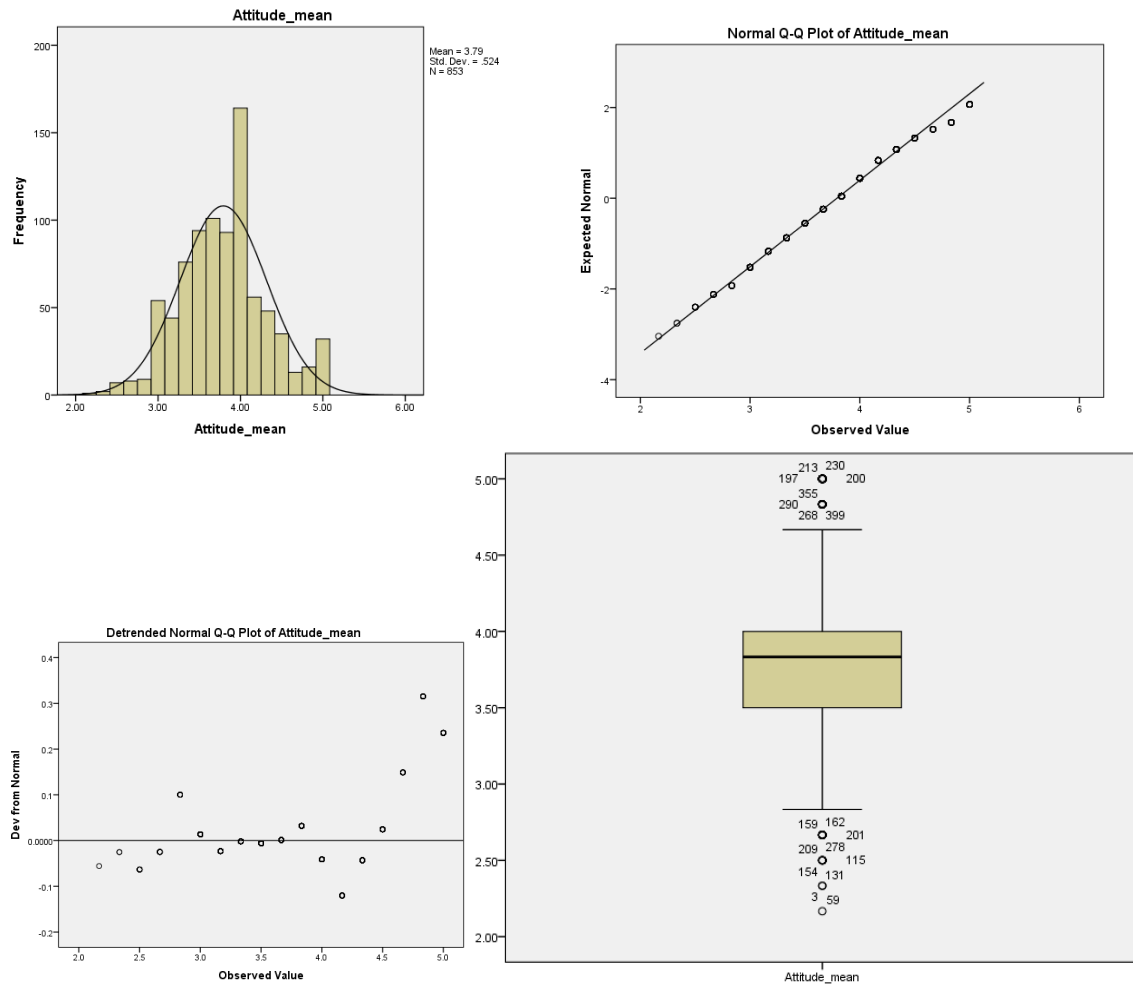
Behavioural Intention to Use ICT

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
IOU_mean	.160	853	.000	.950	853	.000

a. Lilliefors Significance Correction
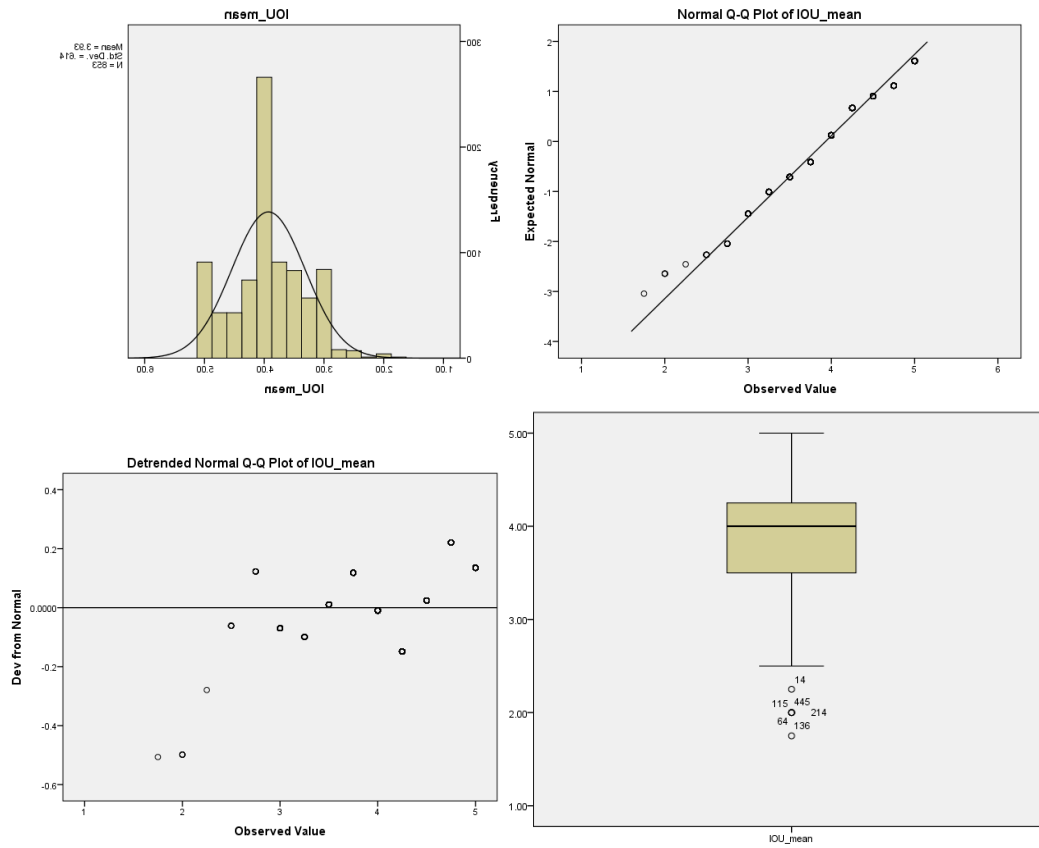
Motivation

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mo_mean	.096	853	.000	.985	853	.000

a. Lilliefors Significance Correction

184
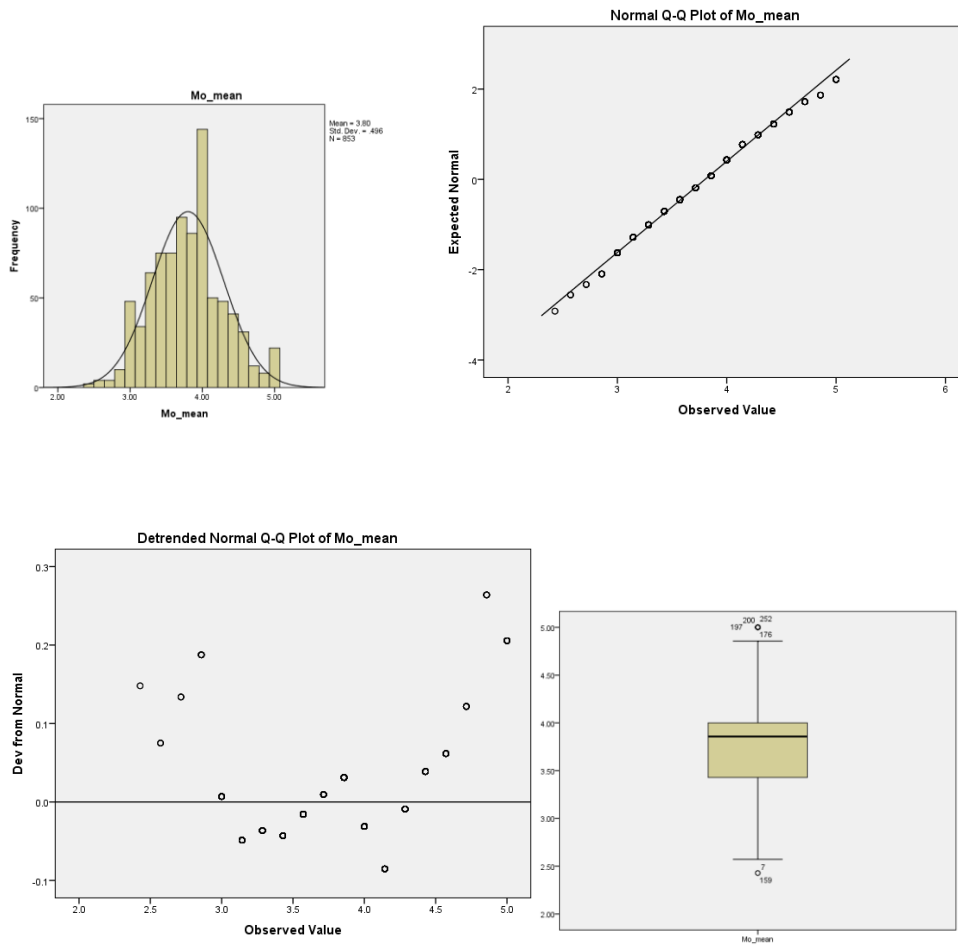
Mastery

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Ms_mean	.103	853	.000	.976	853	.000

a. Lilliefors Significance Correction
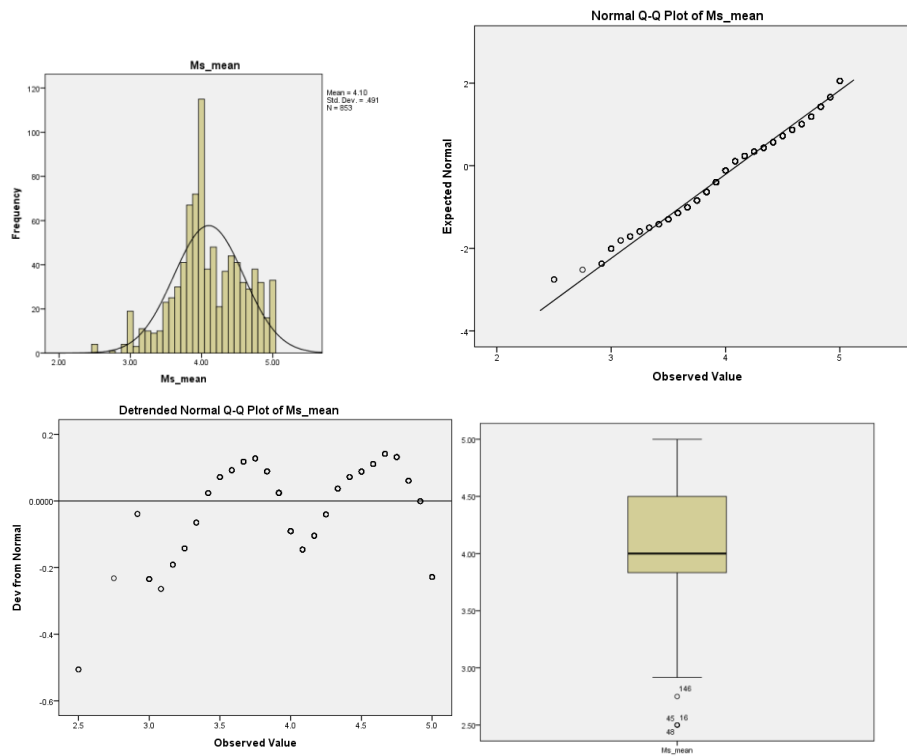
Subjective Norm

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
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SN_mean	.090	853	.000	.982	853	.000

a. Lilliefors Significance Correction
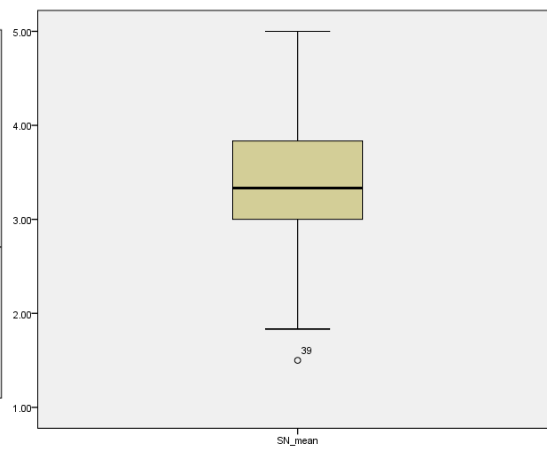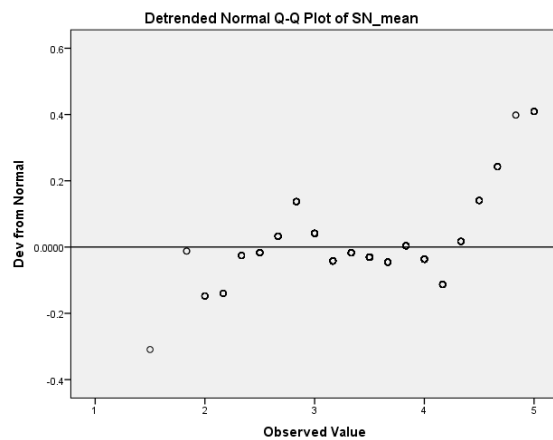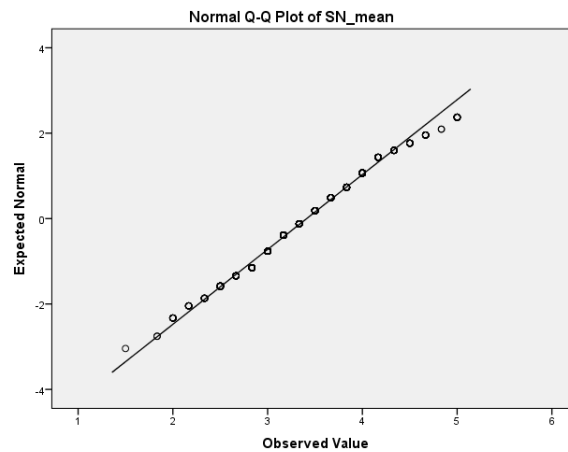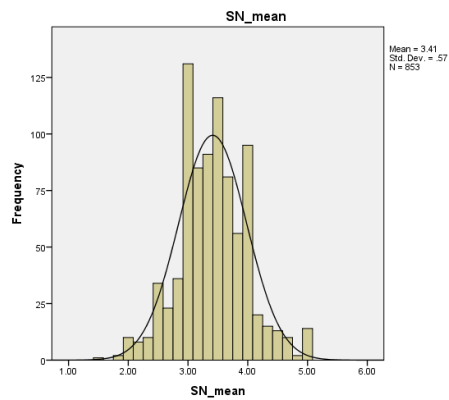
Actual ICT Usage

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
IU_mean	.075	853	.000	.983	853	.000

a. Lilliefors Significance Correction

LINEARITY TEST
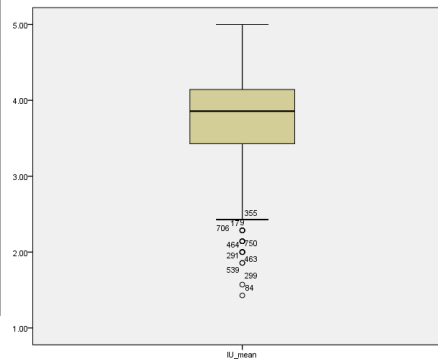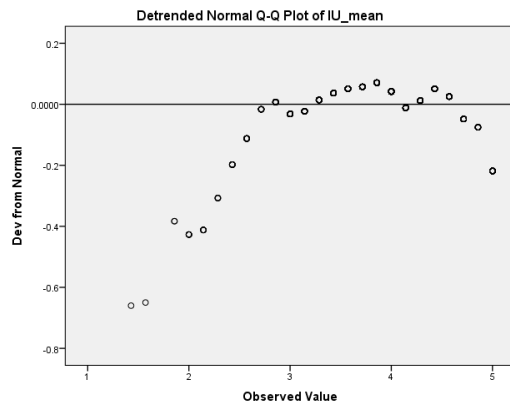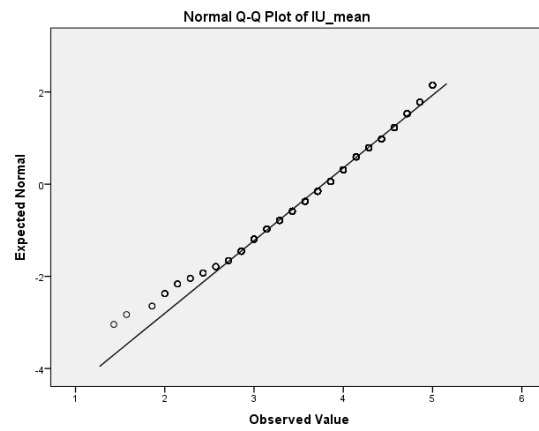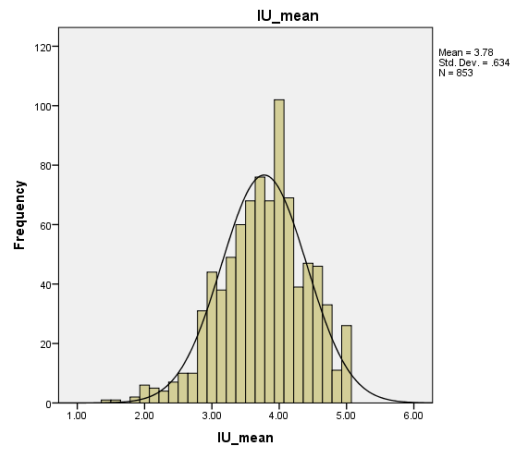
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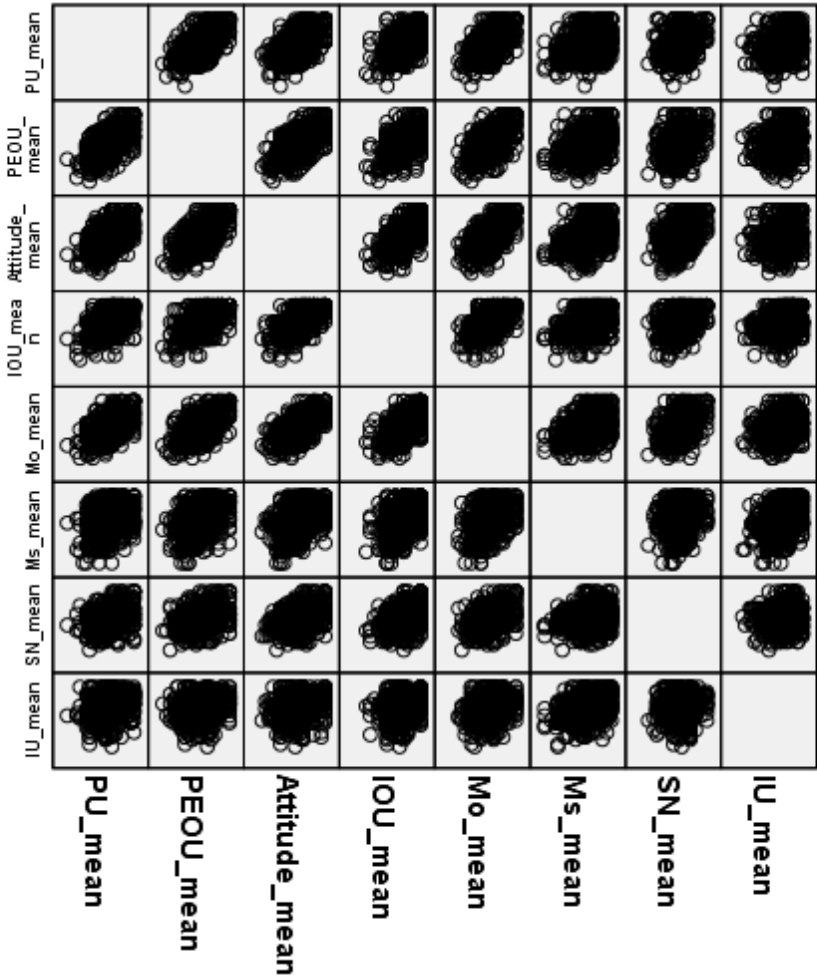
PUBLICATIONS

International Proceedings

Jian Heng Tan, Moses Priscilla, Phaik Kin Cheah. (2018). A Case Study Investigating Perceived Usefulness and Perceives Ease of Use: Determiners of Attitude towards using ICT for Self-Paced Learning among Science Undergraduates. *10th International Conference on Business, Education, Humanities and Social Sciences Studies,* Kuala Lumpur, Malaysia.

Moses Priscilla, Phaik Kin Cheah, Pek Hoon Er, Jian Heng Tan, Mas Nida Md. Khambari. (2016). Exploring the Relationship between ICT Utilization and Motivation, Mastery and Subjective Norm. *24th International Conference on Computers in Education*, Mumbai, India.