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Perceptions of Cloud-Based Applications Adoption by University's Students

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Abstract: Adoption of cloud-based applications is of high importance as a new trend in the field of information technology and the identification of key factors influencing this adoption process. Currently, dedicated studies on the phase of the adoption process in educational domains based on the cloud-based applications were not paid much attention, and works in this domain are very limited. Moreover, despite several frameworks offered in the technological aspects and security issues, no suitable framework is offered. Therefore, this research aims to examine and evaluate the perception and acceptance of adopting cloud computing technology among universities' students (Limkokwing University of Creative Technology as a case study). Technology Acceptance Model (TAM) was used as a model for this research. Self-efficacy, Motivation, Exposure, Perceived Trust, and Cost of Usage were used as external factors for this model. Random sampling and quantitative method were used to examine the hypotheses of the study. Statistical tests of sample data such as correlations, regression and ANOVA analysis were performed to evaluate and model the relationship of the impacts, respectively. The results also revealed useful information to address this issue and eventually a model fit for the adoption of cloud-based applications in higher education was offered.

Keywords: Cloud-Based Applications, Perception, Adoption, Technology Acceptance Model (TAM), Limkokwing University, Malaysia

1. Introduction

Cloud computing is one of the newest technologies in the world. Since the inception of cloud computing, huge companies as Google, Microsoft, and Apple have started competing with each other by providing cloud computing services for their users. It provides three different services which are platforms as a service (PaaS) which allows users to develop applications by providing the needed programming languages and tools by services providers on the cloud infrastructure, services as a service (SaaS) that gives users to use and develop applications provided by their service providers on the cloud infrastructure, and infrastructures as a service (IaaS) that provides users great capability to control the underlying infrastructure without the need of big knowledge about technical equipment.

In spite of the benefits of cloud computing technology adoption in organizations and educations, the end user plays the most important role in its success or failure. Therefore, this research presents a study aimed at investigating universities students' awareness and perception of cloud-based applications.

Since the cloud computing concept was offered by telecommunication companies in 1960, multiple organizations participated in the adoption of it in different domains from small to larger scale [1]. Cloud computing likely has several significant impacts on the education field. Several researchers and universities made some studies and researches on the adoption of cloud computing technology and its influence on the education field [2, 3].

Due to the impacts of cloud computing on education, there are several researchers have proposed adoption models of cloud computing in the system of the universities and institutions toward effective and best practice in using cloud computing technology [4, 5, 6].

With the diffusion of cloud computing technology yet still

there is a gap between this technology and students which leads researchers to investigate about the factors of switching users toward the adoption of cloud technology applications [7]. Taylor [8] also has done his studies on the use of cloud computing application (Google docs) by universities students.

However, even though the cloud computing applications are known by users in general but yet students are not engaging with this great technology due to their own reasons which what the researchers are trying to investigate and analyze. This research is analyzing how students are aware and perceive of cloud computing applications and services.

The research is focusing on university students' awareness and perception of cloud computing applications and services. In order to complete this research, the research questions have been formulated. The questions are (1) How students are aware and perceptive of cloud-based applications? (2) What factors are affecting the students of using cloud-based applications? (3) What are the recommendations for better adoption of cloud computing?

This study seeks an attempt to investigate the perceptions of adoption cloud-based applications among university students. In order to reach our objectives, the Technology Acceptance Model (TAM) will be used as a conceptual framework. This research will be limited to a sample of over 100 students of Limkokwing University of Creative Technology.

The awareness and perceiving of cloud computing applications among students can be studied by the understanding of their perception and usage toward the adoption cloud computing applications, this study can be an opportunity for the universities and institutions to introducing cloud computing infrastructure and adopting cloud computing platform into their structure of education.

This study will be limited to students located in Limkokwing University of Creative Technology in Cyberjaya Malaysia. Example of popular cloud computing applications will be provided in the questionnaire to help students answering better.

Several cloud-based applications are provided to be used by universities and students to allow them to benefit from this great technology in higher education. Students are the main users of cloud-based applications. In this study, some cloud-based applications that can be adopted by students will be reviewed and the factors of students' adoption will be analyzed by using the TAM model.

Based on that, the key objectives of the study were (1) To investigate how students are aware and perceived of cloud-based applications (2) To identify the factors of students' intention of adopting cloud computing applications and (3) To develop a suitable framework for adoption of cloud-based applications.

Through examining the study factors using descriptive (Mean Index), Correlation and Regression analyses, it was found that the level of acceptance for all factors varied between moderate and high. Furthermore, the ranking of each factor has been evaluated through multiple regressions to illustrate a new model to present the level of impact of factor to another.

2. Materials and Methods

2.1. Research Design

As a perspective of this study, exploratory research design is followed due to the objectives of this study that need to be achieved. Therefore, for the purpose of this study, quantitative research methodology is selected to conduct the exploratory study. The quantitative technique is based on counting and evaluating the different variables, data are collected and analyzed using the Statistical Package for the Social Sciences (SPSS).

2.2. Data Collection

As the purpose of this study is to provide suggestions based on the achieved results by the investigation of students, random sampling is the most suitable and reasonable method for this generalization.

The literature review and studies investigation related to the main phenomena can lead to proper and appropriate questionnaire samples. Planning for this study's objectives with experienced is very important to prepare a suitable and responsive questionnaire.

Multiple questionnaires from different related works were reviewed and collected as the guidelines. Eventually, the final questionnaire design was made by using Google Forms and printed to be distributed on the field.

In order to successfully make this study, a draft of the questionnaire was given to seven students of Limkokwing University of Creative Technology, Cyberjaya Campus, Selangor, Malaysia in June 2017 in order to read the questions carefully; and get their ideas and opinions on the quality of the provided questions and how relevant these questions with each other to identify any ambiguous or irrelevant question to the participant. After receiving their feedback and comments, some adjustments have been made on the questions of the questionnaire based on the participants' opinion. The adjustment was by changing some sentences to be clearer to the readers and some questions have been removed and changed. Eventually, the final design of the questionnaire was made and distributed accordingly to the research location and domain. Therefore, the main research was conducted during the second semester between July and November 2017.

The participants of this study were from both genders, from different age groups and faculty. The main criteria of this study in selecting participants are to be a student in Limkokwing University of Creative Technology. A total of 135 questionnaires distributed while 100 questionnaires were returned.

Likert scale is applied in this questionnaire as the standard categorical agree-disagree response in form of ordinal scale categorize [9] for five-point of (strongly disagree=1, disagree=2, not sure=3, agree=4, strongly agree=5) which is being implied to quantify the components of this research.

Table 1. *List of Factors involved in the model and hypotheses.*

Variable	Description	Source
PU	Perceived usefulness	Davis [10]; Agarwal and Prasad [11]; Bachleda and Quaaziz [12]
PEOU	Perceived ease of use	Davis [10]; Agarwal and Prasad [11]; Bachleda and Quaaziz [12]
AT	Attitude toward use	Park [13]; Alotaibi [14]
ST	Structural trust	McKnight al el. [15]; Alotaibi [14]; Bachleda and Quaaziz [12]
BI	Behavioral intention	Davis [10]; Agarwal and Prasad [11]; Alotaibi [14]; Bachleda and Quaaziz [12]
AU	Actual system use	
SE	Perceived self-efficacy	Park [13]
E	Exposure	Wu [16]
M	Motivation	Chung [17]
C	Cost of usage	Changchit [18]

2.3. Questionnaire Development

There are different factors have been examined by researchers in term of acceptance and adoption of technology. The following table 2 is showing some of these factors:

Table 2. *General list of factors studied related to adoption.*

Factor	Reference
Subjective norm	Park [13]; Irshad and Johar [19]; Venkatesh, Morris, and Davis [20]; Taylor [8]
System accessibility	Park [13]
Speed of access	Changchit [18]
Cost of usage	
Anxiety	
Perceived risk	Alotaibi [14]
Trust	
Self-efficacy	Park [13]
Motivation	Chung [17]; Fan [21]
Organizational culture	Venkatesh, Morris, and Davis [20]; Fan [21]
Exposure	Wu [16]

Questionnaire prepared according to the objectives of this study by using Google Form and printed to be distributed and filled by the participants. The questionnaire is divided into two sections; the first section is about demographic factors and background about the participants. The second section entails of 8 categories, which sequentially are:

A. Perceived Usefulness (PU)
B. Perceived Ease of Use (PEOU)
C. Attitude Toward Use (AT)
D. Structural Trust (ST)
E. Behavioral Intention (BI)
F. Acceptance to Use (AU)
G. Human Factor
   a. Exposure (E)
   b. Motivation (M)
   c. Self-efficacy (SE)
H. Adoption of Cloud Computing
   d. Cost of Usage (C)

2.4. Background and Demographic Factors

This section in the questionnaire investigates some information about the participants that might be helpful and reasonable about participants' answers.

2.5. Model Development and Hypotheses

Based on the study's objectives, evaluation of selected factors as some of the important parameters impacting on the cloud-based applications adoption successfully is investigated and analyzed in this study. As it is mentioned in chapter 2, the Technology Acceptance Model is an appropriate and suitable to the analyzing scenario for these factors. Based on that, and on the preliminary investigation made and the initial proposal on the influence of external variables on cloud-based application adoption among students, Exposure, Motivation, Self-efficacy, Structural Trust, and Cost of usage were added to the research model in order to increase the exploration of this study.

TAM, in general, has five clear constructs (PEOU, PU, AT, BI, and AU) which could be enhanced in the context of the adoption of cloud-based applications. The following hypotheses show a clear impact between the constructs:

(1) Hypothesis 1: Perceived usefulness will have a positive impact on the attitude toward using cloud-based applications
(2) Hypothesis 2: Perceived usefulness will have a positive impact on the behavioral intention to use cloud-based applications
(3) Hypothesis 3: perceived ease of use will influence the perceived usefulness positively of cloud-based applications
(4) Hypothesis 4: perceived ease of use will impact the attitude toward using cloud-based applications positively
(5) Hypothesis 5: Attitude toward using cloud-based application will have a positive impact on the

behavioral intention to use it.

With modifying the model by adding Exposure, Motivation, Self-efficacy, and Cost of usage as the external variables of TAM:

(1) Hypothesis 6: Structural trust will have a positive impact on the perceived usefulness of cloud-based applications adoption
(2) Hypothesis 7: Structural trust will have a positive impact on perceived ease of use of cloud-based applications adoption
(3) Hypothesis 8: Structural trust will have a positive impact on behavioral intention to use cloud-based applications adoption
(4) Hypothesis 9: Exposure will have a positive impact on the perceived usefulness of cloud-based applications adoption
(5) Hypothesis 10: Exposure will have a positive impact on perceived ease of use of adoption cloud-based applications
(6) Hypothesis 11: Exposure will have a positive impact on behavioral intention to adopt cloud-based applications
(7) Hypothesis 12: Motivation will have a positive influence on the perceived usefulness of cloud-based applications adoption
(8) Hypothesis 13: Motivation will have a positive influence on perceived ease of use of adoption cloud-based applications
(9) Hypothesis 14: Self-efficacy will have a significant impact on the perceived usefulness of cloud-based applications adoption
(10) Hypothesis 15: Self-efficacy will have a significance on perceived ease of use of adoption cloud-based applications
(11) Hypothesis 16: Self-efficacy will have a significant impact on behavioral intention to adopt cloud-based applications
(12) Hypothesis 17: Cost of usage will have a significant impact on the attitude toward the use of cloud-based applications
(13) Hypothesis 18: Cost of usage will have a significant impact on behavioral intention to adopt cloud-based applications.

The proposed model of TAM with the factors adjusted as external variables is presented with the hypotheses in the following figure:

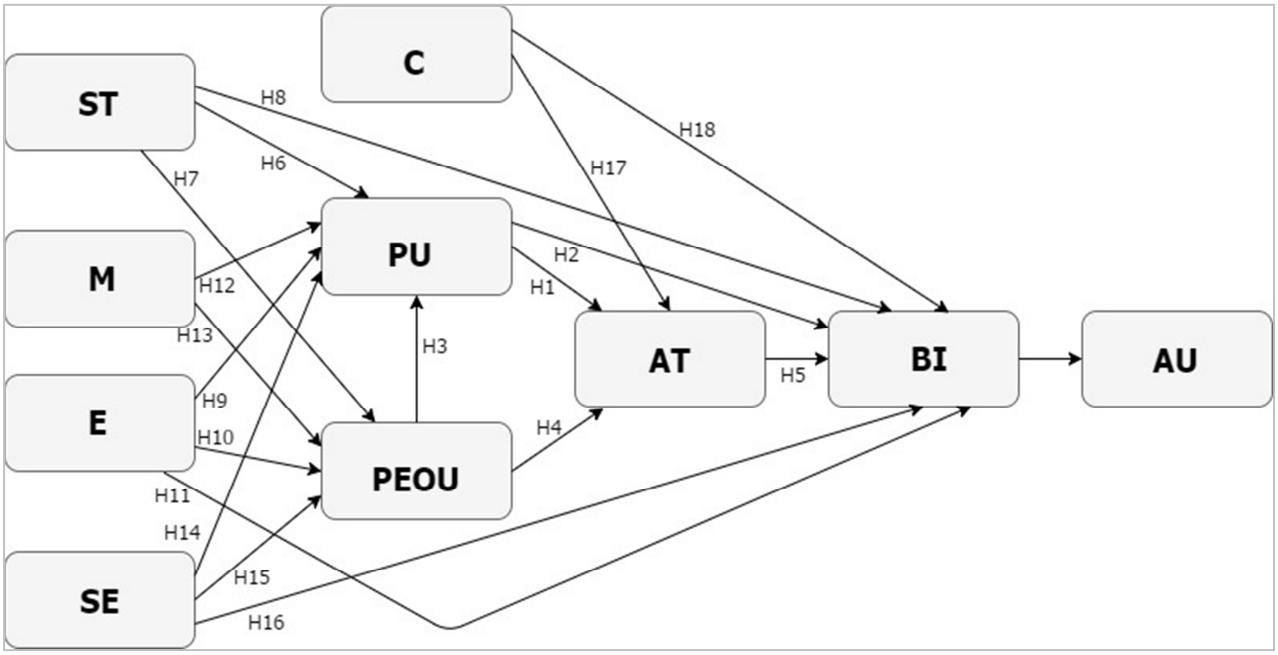

Figure 1. *Proposed model of the research.*

3. Results

3.1. KMO Factor Analysis

Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy has been carried out for testing the reliability of the factors on the questions. Values of KMO lower than 0.5 are rejected and not acceptable, 0.5-0.6 are accepted, 0.6- 0.7 are moderate, 0.7 – 0.8 are good, 0.8 – 0.9 are great, and 0.9 – 1 are excellent [22].

Table 3. *KMO and Bartlett's Test.*

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.897
Bartlett's Test of Sphericity	Approx. Chi-Square	857.907
	df	45
	Sig.	.000

As shown in the table above, the outcome of the KMO and Bartlett's test is 0.897 which means that it is a great significance on the factors reliability.

3.2. Reliability Analysis

As shown in the above table, the results of the test for the factors indicate Cronbach's alpha of 0.930 and Cronbach's alpha based on standardized items of 0.928 which both of them are higher than 0.9 and are significantly reliable. Based on these results, the analysis will be proceeding to the next step.

Table 4. *Alpha Reliability Statistics test.*

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.930	.928	10

Table 5. *Cronbach's alpha for all questionnaire factors.*

Factor	**Cronbach's Alpha**
Perceived usefulness	0.921
Perceived ease of use	0.898
Attitude toward use	0.854
Structural trust	0.894
Behavioral Intention	0.893
Actual system use	0.726
Perceived self-efficacy	0.695
Exposure	0.732
Motivation	0.849
Cost of usage	0.735

As shown in the table above, each factor is presented with the questions numbers and the Cronbach's alpha. The Cronbach's value of each factor is higher or around 0.7 which is significantly reliable and no factor will be eliminated.

Table 6. *Summary statistics of all 10 variables.*

Summary Item Statistics	**Mean**	**Minimum**	**Maximum**	**Range**	**Maximum / Minimum**	**Variance**	**N of Items**
Item Means	3.463	2.903	3.834	.931	1.321	.092	10
Item Variances	.657	.351	.937	.585	2.665	.038	10
Inter-Item Covariances	.374	.055	.712	.658	13.035	.030	10
Inter-Item Correlations	.565	.117	.862	.745	7.345	.037	10

As shown in the table above, the statistics item summary is presented.

3.3. Questionnaire Analysis

3.3.1. Demographic Factors Analysis

(1) Gender - The participants of the survey were 30% female and 70% male.

(2) Faculty - 21% of the participants are students of faculty information and communication technology, 20% of the participants are studying under faculty of business and management global, 18% of the participants are studying in postgraduate center, 16% are architecture students, 10% under faculty of design, 4% are from faculty of civil engineering, faculty of communication and broadcasting, and faculty of multimedia while 3% of the participants didn't specify their faculty.

(3) Age - 64% of the participants are in the range of 18 – 24 years old, 33% between 25 - 30, and 3% are above 30 years.

(4) Experience - 76% of the participants do not have any working experience, 15% is a fresh entry, and 6% were having experience from 1 – 3 years. While there was only 3% of the participants were having more than 3 years of working experience.

(5) Familiarity with Computer - means how the user is using the pc daily as a routine. 27% of the participants are basic users, 24% are intermediate users, and 40% are advanced computer users. While there are 9% only advanced IT, related users.

(6) Internet Usage - 49% of the participants are advanced internet usage and access, 31% are intermediate users of the internet, 11% are advanced IT related users such as system admin or server admin, and 9% of the participants are rating themselves as basic users.

(7) Familiarity with cloud-based applications - 17% of them has not ever used any of cloud-based applications, while 83% have used one at least a cloud-based application. From those students who have used the cloud-based applications before, 36.1% of the participants are familiar with the cloud from 1 – 3 years, 30.1% of them are familiar with the cloud applications for less than 6 months, and 18.1% are familiar with it from 6 months – 1 year. And there are 15.7% of them are familiar with the cloud for more than 3 years.

3.3.2. Questionnaire Descriptive Analysis

In the following table 7 below, listed factors of the study are presented provided with the Mean and Standard Deviation.

Table 7. *Questionnaire Descriptive Analysis (Mean and std. Deviation).*

Factor	Mean	Standard deviation	Level of Acceptance
Perceived usefulness	3.6450	0.93080	High
Perceived ease of use	3.6520	0.86111	High
Attitude toward use	3.4300	0.97318	Moderate
Structural trust	3.4867	0.842	Moderate
Behavioural intention	3.3280	0.91741	Moderate
Actual system use	2.9900	0.95076	Moderate
Perceived self-efficacy	3.2333	0.89706	Moderate
Exposure	3.1300	0.86811	Moderate
Motivation	3.1343	0.75233	Moderate
Cost of usage	3.6175	0.73034	High

3.4. Test of Hypotheses

Table 8. *Results of all the variables regression.*

Independent	Dependent	B	Std. Err	T-value	Sig.
PU	BI	0.764	0.063	12.153	0.000
	AT	0.608	0.097	6.245	0.000
PEOU	AT	0.372	0.105	3.538	0.001
	PU	0.700	0.83	8.436	0.000
ST	PU	0.750	0.064	11.806	0.000
	PEOU	0.692	0.059	11.707	0.000
	BI	0.806	0.054	14.995	0.000
M	PU	0.536	0.158	3.403	0.001
	PEOU	0.481	.105	4.586	0.000
E	PU	0.497	0.139	3.577	0.001
	BI	0.815	0.088	9.245	0.000
	PEOU	0.632	.094	6.764	0.000
SE	PU	0.282	0.101	2.794	0.006
	BI	0.476	0.091	5.210	0.000
	PEOU	0.239	0.094	2.547	0.012
AT	BI	0.741	0.073	10.120	0.000
C	AT	0.822	0.106	7.753	0.000
	BI	0.789	0.099	7.985	0.000

As shown in the table above, the regression results analysis of different factors in the proposed model are provided. Regression analysis was accomplished for all the external variables of the proposed model (Perceived Trust, Self-efficacy, Exposure, Motivation, and Cost of usage) on all other dependent variables in TAM to provide a wide insight through the scenario, despite of having different hypotheses related to the impact level of the both internal and external variables in the proposed model.

As shown in table 9 above, PU has a high influence on BI (B =0.764 and sig. =0.000) and AT (B =0.608 and sig. =0.000). Additionally, PEOU has high influence on PU (B =0.700 and sig. =0.000) and moderate influence on AT (B =0.372 and sig. =0.001). Moreover, AT has a high influence on BI (B =0.741 and sig. =0.000) in the TAM model.

Perceived Structural as it is shown in the above table, has higher B values among all other factors of 0.75, 0.806, and 0.692 on PU, PEOU, and BI respectively.

Based on the discussion and the results showed, the following table is showing each hypothesis and its status:

Table 9. *Hypotheses list and their status after evaluation.*

Hypothesis	B	Std. Err	T-value	Sig.	Status
H1: PU -> BI	0.608	0.097	6.245	0.000	Accepted
H2: PU -> AT	0.764	0.063	12.153	0.000	Accepted
H3: PEOU -> PU	0.700	0.83	8.436	0.000	Accepted
H4: PEOU -> AT	0.372	0.105	3.538	0.001	Accepted
H5: AT -> BI	0.741	0.073	10.120	0.000	Accepted
H6: ST -> PU	0.750	0.064	11.806	0.000	Accepted
H7: ST -> PEOU	0.692	0.059	11.707	0.000	Accepted
H8: ST -> BI	0.806	0.054	14.995	0.000	Accepted
H9: E -> PU	0.497	0.139	3.577	0.001	Accepted
H10: E -> PEOU	0.632	.094	6.764	0.000	Accepted
H11: E –> BI	0.815	0.088	9.245	0.000	Accepted
H12: M -> PU	0.536	0.158	3.403	0.001	Accepted

Hypothesis	B	Std. Err	T-value	Sig.	Status
H13: M -> PEOU	0.481	.105	4.586	0.000	Accepted
H14: SE -> PU	0.282	0.101	2.794	0.006	Accepted
H15: SE -> PEOU	0.239	0.094	2.547	0.012	Accepted
H16: SE -> BI	0.476	0.091	5.210	0.000	Accepted
H17: C -> AT	0.822	0.106	7.753	0.000	Accepted
H18: C -> BI	0.789	0.099	7.985	0.000	Accepted

As shown in the table above, the hypotheses test was made and it is based on the Sig. and B value hypotheses are accepted or rejected.

3.5. Analysis Conclusion

From the above discussion, the researchers can conclude that:

(1) PU has a high impact on BI and AT which match the original TAM model. Based on the findings presented in table 9, if students found cloud-based applications useful, will tend for them to adopt and use for their academic activities and personal used too.

(2) PEOU has a high impact on PU and AT which match the original TAM model. So, if a student found that cloud-based applications are easy to use, will be having higher intention to use it.

(3) AT has a strong influence on BI which also matches the original TAM.

(4) ST has the highest impact values on PU, PEOU, and BI with β values of 0.750, 0.692, and 0.806 respectively. Hence, students who feel safe and secure have high intention to use cloud-based applications.

(5) Exposure has a moderate impact on PU and higher impact on PEOU and BI of β values of 0.497, 0.632, and 0.815 respectively. Hence, students who have been exposed will have a higher intention to adopt cloud-based applications.

(6) Motivation has a moderate influence on PU and PEOU. This means motivated students will have the intention to adopt cloud-based applications.

(7) Self-efficacy has a low impact on PU and PEOU, and moderate impact on BI.

(8) Cost of usage has a high impact on AT and BI. Students will have a higher intention to use the free cloud-based application rather than the paid one.

3.6. Evaluation of Motivation Impact

Based on the analysis provided in this chapter, the influence of motivation (independent variable) on different dependent variable was provided. The participants were asked to state if they were anyhow motivated by any of the mentioned (friends, family member, supervisor, lecturer, and important IT person) due to the question structure regarding motivation. The responses of participants are illustrated in figure 2 below in a form of a graph to provide a perception to the significance of how different individuals have the ability to motivate a student to adopt cloud-based applications.

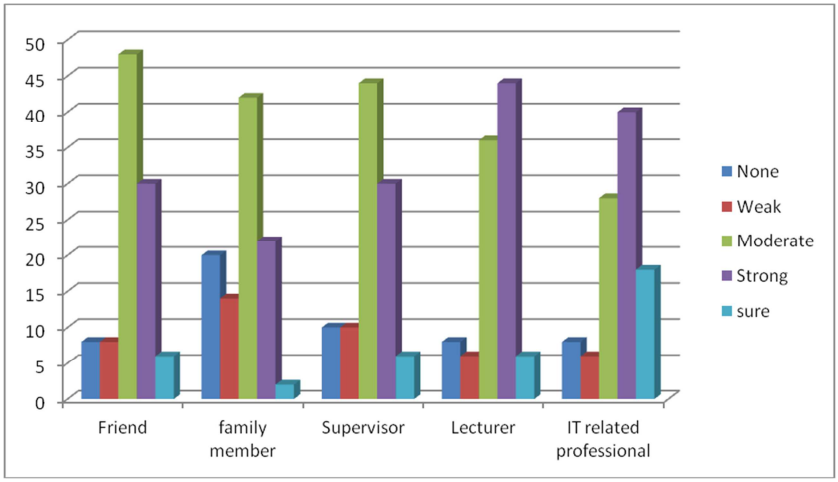

Figure 2. *Motivation impact to adopt cloud-based applications.*

A large number of students was highly motivated to use cloud-based applications by their important IT-related professional. This number decreased but still strongly motivated by a lecturer, supervisor, IT professional person, and friend. A high number of students were impacted moderately by their friends, family members, supervisors, and lecturers. Additionally, a large number of participants claimed that they are strongly used cloud-based applications after being motivated by their lecturers, supervisors, important professional persons, and friends. The family member role is not that high for participants but still can be considered.

The researchers can say that students influenced by many different of the contacts who routinely interact with. The level of the impact is changing based on the routine interact or trust with. Regardless of the contact that students interact

with, there is a high level of impact on exposing students with the cloud-based applications and motivating them to use and adopt it. Hence, this makes us consider the contacts surrounded by each student that might influence the cloud-based applications adoption significantly.

3.7. Investigations Based on the Demographic Factors

Demographic factors such as gender and age have been studied in different previous studies on TAM and considered as the moderating effect on users' acceptance behavior [23]. In this section, investigation based on the gender and age will be performed to identify if there are significant impact levels in PEOU and PU.

3.7.1. Gender

To perform the test on PEOU and PU, independent samples T-test will be performed in order to know.

Table 10. *Significance level of PEOU and PU based on gender.*

	DF	N	Mean	Std. Deviation	Std. Error Mean	Sig.	t- value
PU	male	70	3.6357	1.05525	.12613	.001	-.152
	female	30	3.6667	.55450	.10124		
PEOU	male	70	3.6457	.98108	.11726	.030	.097
	female	30	3.6267	.65122	.11890		

There is a significant difference level of PEOU and PU based on the gender of participants. Based on the sig. value of this test, there is a significantly different impact PU and PEOU based on the gender of sig value .001 and .03 respectively. Hence this would open further investigations regarding the adoption between the different genders.

3.7.2. Age

To perform the test on PEOU and PU, One-way ANOVA test will be performed.

Table 11. *ANOVA analysis output of different age groups on PU and PEOU.*

ANOVA		Sum of Squares	df	Mean Square	F	Sig.
PU	Between Groups	4.025	2	2.013	2.388	.097
	Within Groups	81.747	97	.843		
	Total	85.773	99			
PEOU	Between Groups	1.764	2	.882	1.112	.333
	Within Groups	76.956	97	.793		
	Total	78.720	99			

As shown above, all the sig. > 0.05 which shows that no statistically significant difference between the age groups on PU and PEOU.

3.8. Final Fit Model

Based on the results provided in Table 9 above, all the proposed hypotheses were supported, despite the impact level of each factor to another factor, the influence does exist. The following model is the fit model of this study of cloud-based applications adoption among university students (Limkokwing University of Creative Technology as a case study) in which presents the impact level on the dependent variables from independent variables.

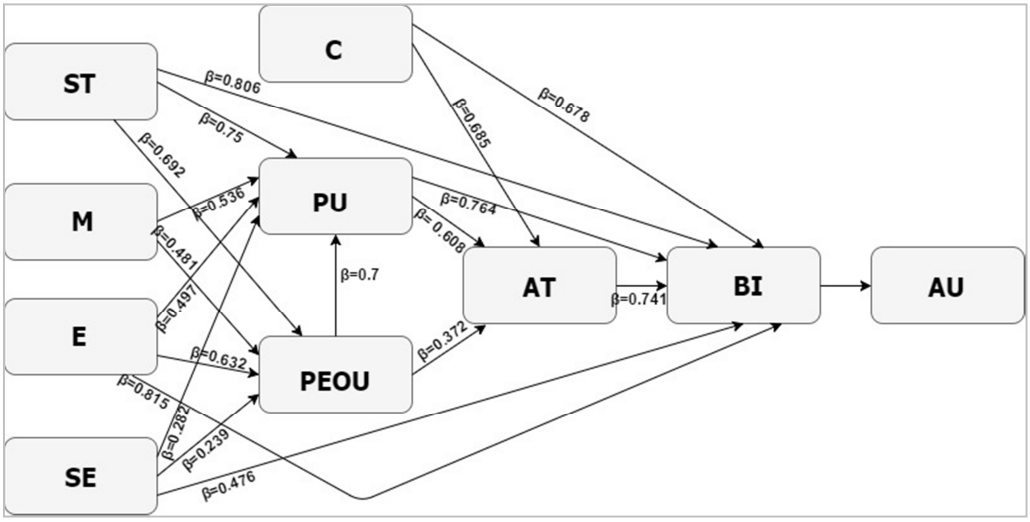

Figure 3. *Final Fit Model.*

According to figure 3 above, different impact levels of external variables on the factors of adoption cloud-based application were presented.

4. Discussion

From perceived of usefulness point of view, students need to feel that the cloud-based applications will improve their performance and effectiveness in doing their work, weather-related to their study or for personal usage, in order to increase their attitude toward use and intention to use of that particular cloud-based application which will lead at the end to the actual use and adopt the application. Thus, perceived usefulness will increase the cloud-based applications adoption indirectly of students.

Awareness of cloud-based applications usefulness should be provided by universities and institutions through seminars and workshops to introduce to the students the useful features of the cloud-based application and their applications in the domain of higher education. Moreover, students should be advised and guided by their lecturers and supervisors to use cloud-based applications in their study and assignments if possible.

From the viewpoint of perceived ease of use, students need to feel and understand that the cloud-based application is easy to use in which make students use this great technology with no fear of facing difficulties in using it which will increase the attitude toward use and intention to use cloud-based applications. Hence, perceived ease of use has an indirect influence on cloud-based applications adoption in this study.

Awareness of cloud-based applications ease of use should be supported by universities and institutions by providing the cloud platform for their students to access the cloud-based applications easily inside the university or institution, beside that seminars and workshops should be held by universities and institutions to explain and show students how easy cloud-based applications are and how to get the best out of all of that. Furthermore, universities and institutions management should encourage the lecturers to introduce and provide information regarding the ease of use of cloud-based applications for higher education.

Perception of cloud-based attitude toward use should be having a positive feeling about using it by students in order to increase the intention of using the applications of cloud-based. The impact of attitude toward use is having a direct effect on cloud-based applications adoption.

From attitude toward use point of view, universities and institutions need to plan to introduce the technologies and their benefits to encourage their students to use the cloud-based applications. This way of thinking could keep in students' mind that new technologies usually come with extra benefits.

Motivation is an important factor leads to the adoption of cloud-based applications indirectly through increasing the motivated students' attitude toward use and intention to use. In order to increase students' motivation, lecturers and supervisors need to motivate them due to the high impact of them on students. They need to offer to their students' cloud-based applications to use which will be a high motivation for students to start using and utilize this great technology. Lecturers also can motivate students by adding an extra bonus for students who use the cloud-based application in their assignments and study. Moreover, students can be motivated by highlighting the specifications and features of cloud-based platforms in the workshops and seminars.

Exposure is another important factor can be led to the adoption of cloud-based applications. It will not affect the adoption directly but through the significant impact on increasing the attitude toward use and intention to use of this technology. When a student is being interacted with classmates, friends or receive positive news from workshops or news about the particular cloud-based application; this will increase the attitude toward use and intention to use it.

Lecturers should think in a proper way to expose the students with cloud-based applications by increasing the sense of offering useful and good things among society's members. Furthermore, the concept of cloud-based application should be held through workshops and seminars to expose the students more.

Structural trust is one of the important factors for students to make them consider the adoption of cloud-based applications. Increasing the trust between the student and cloud-based application should be considered by explaining and showing them how the trusted cloud-based applications are safe, secure and reliable. This can happen through workshops and seminars that show students the different encryption methods used in the different cloud-based applications.

Self-efficacy has a high influence on different variables of all stages of the cloud-based application adoption. From the analysis results, it has shown that self-efficacy have high impact level on perceived of usefulness, attitude toward use, and behavioral intention which means that self-efficacy has a high impact on the adoption of cloud-based applications indirectly.

Lecturers need to increase the sense of students' efficient, confidence and creativity which can lead to an increase the level students' independence and at the same time avoid making them dependents and followers.

Students with moderate or above experience in different technological or academicals experience were using cloud-based applications more than others which mean that having higher experience in the information technology field may have a positive influence in all of technology acceptance model variables. Hence, the experience is a positive indirect variable affecting the acceptance and adoption of a cloud-based application.

From experience point of view, students should be practiced to use cloud-based applications effectively in different ways because the adoption of trained people could be easier due to the frequent engagements with the technologies.

As Limkokwing University of Creative Technology is the case study of this research and based on the results of the study, The authors would recommend the above suggestions

and recommendations to be applied in this great university to be counted as an early stage of implementing cloud-based platform in their setting, especially in the faculty of information and communication technology, to transform the students to a new era of education by implementing SaaS or PaaS to increase the quality of education and to utilize from the benefits provided to students as the researchers have mentioned in chapter 2.

While doing this study, some challenges and barriers have been faced, confusing and time-consuming were the main challenges in this study. Additionally, some obstacles were delaying the progress of this study to be done. However, despite all of these limitations and obstacles, the passion and the interest in complete the task in a way it should be done.

Due to the short period of time in doing this research, several limitations in terms of objectives and scope existed which affected understanding whole the process of adopting cloud-based applications successfully in higher education. Here are some suggestions for further work that need to be done for better understanding and successfully adoption cloud-based applications in higher education:

(1) In-depth research needs to be done by using both qualitative and quantitative research approaches for more investigation in the adoption of cloud-based applications in higher education
(2) Including more social factors and interactional parameters affecting the process of cloud-based applications adoption
(3) Increase the scope of the study for larger scale analysis
(4) Consider the lecturers and staffs in the study.

5. Conclusion

The study has achieved its objectives successfully, through identifying and understanding the factors that lead students to adopt cloud-based applications. A model development with reference to the Technology Acceptance Model (TAM) was made using different factors (Motivation, Exposure, Self-efficacy, Trust, and Cost of usage) as the external variables. The influence of each factor proposed in the model of this study was identified in this stage, and the impact level between each dependent and the independent variable was evaluated. Eventually, the final fit model for cloud-based applications adoption in the higher education of this study was presented. Several recommendations in this study were presented based on the final results as it has mentioned in this research objectives. Several guidelines were presented in order to have better cloud-based applications adoption in the domain of higher education.

6. Significance Statements

This study discovered that these findings can help understand what students at university think of cloud computing and help institutions find ways to use it to improve the educational services they provide the students. Not only students, but the staff, and the institution can benefit from this study. Cloud computing is not only meant for everyday use but it can also help in bringing financial or resource management benefits to an educational institution.

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