# A Study of Undergraduate Students and Instructors' Adoption of Technological Innovation in M-Learning at Higher Education in Battambang, Cambodia

**Pok Panhavuth[1*] Nootjarie Boonget[1] and Prachit Intaganok[1]**

[1]Surindra Rajabhat University

## Abstract

M-Learning is the new tool for education in the 21st century. The objective of this study is figure out the undergraduate students and instructors' adoption of technological innovation in M-Learning at higher education in Battambang, Cambodia regarding level of adoption, behavior, readiness and attitude and availability and accessibility of technological innovation. There are 359 undergraduate students and 40 instructors joined this survey research. The results show that undergraduate students' adoption of technological innovation in M-Learning is at fair level with no significant difference regarding gender, type of university, and academic year of study. Similarly, the instructors' adoption of technological innovation in M-Learning is at good level. They have positive behavior, attitude and readiness while technological innovation is fairly available and accessible. This useful research finding may provide key information to policy makers and educators for developing strategy towards the adoption of M-Learning for higher education in developing countries.

**Keywords:** Adoption, M-Learning, Technological Innovation, Instructor, Undergraduate Student, Battambang Cambodia

## Introduction

Education is the main focus for human development and The Education 2030 of INCHEON Declaration sets out a new vision for education for the inclusive and equitable quality education and lifelong learning opportunities for all. Technological innovation is considered the gateway for equitable lifelong learning (UNESCO, 2015). In Cambodia, M-Learning as part of Information Communication Technology in Education (ICT in Education) has become the main focus in the Master Plan for ICT in Education. Mobile technologies have been influencing ways of learning in both developed and developing worlds (Wong, 2011; Khieng, S., Srinivasa, M., & Chhem, R., 2015). M-Learning helps the undergraduate students and instructors to use in classroom and at home (NGO Education Partnership, 2014; Khieng, S., Srinivasa, M., & Chhem, R., 2015) even it is so far also with some challenges in using the mobile technologies for the full implementation of the existing ICT implementation plan (Richardson, 2014; Khieng, S., Srinivasa, M., & Chhem, R., 2015), but recent research indicates a

*ผู้ประสานงานหลัก (Corresponding Author)
E-mail : pokpanhavuth@gmail.com



*รับต้นฉบับ 19 กุมภาพันธ์ 2563 ปรับแก้ไขตามข้อเสนอแนะของผู้ทรงคุณวุฒิ 17 กรกฎาคม 2563 รับลงตีพิมพ์ 31 สิงหาคม 2563*

potential for successful instruction (Pou, S., Sok, S., Courtney, W., Alice, B., Kevin, N., & Khoun, T., 2016). There are many strategies in Cambodian higher education developed and implemented (MOEYS 2014a, 2009; Khieng, S., Srinivasa, M., & Chhem, R., 2015) to meet learners' diverse needs depends on the individual's perception towards the innovation (Mutono, A., 2016) and students don't hold the same philosophy of learning as in the past (Bunlay et al., 2009; Heng, K., 2012).

M-learning is positive among many teachers and students, but the implementation with several issues of relating to the design of the app (Oakley, G., Pegrum, M., & Kheang, T., 2018). The survey of mobile phones and internet use in Cambodia (Phong, K., Srou, L., & Sola, J., 2016) shows that over 96% of Cambodians claiming to own their own phone and some 48% of Cambodians were found to have at least one smartphone. Battambang town is one of the three ASEAN smart cities networks of Cambodia with the significant growth of the adoption of mobile devices towards M-Learning. As the first pilot study on 12 university students at University of Battambang shows that students enjoy the smart phone for daily communication with some access for online education. This study will focus on the undergraduate students' and instructors' adoption of the technological innovation in M-Learning in the Battambang Province, Cambodia.

1. Mobile Technology and M-Learning

Mobile technology is considered the most embraced technology in the world can contribute for collaboration and communication of practice (Stead, 2005; Al-Lozi, E., Al-Hujran, O., & Al-Debei, M., 2014) to meet the needs of 21st century undergraduate students and instructors (Ross, 2013; Ting, 2012; Fitts, T. H., 2015). Mobile learning (M-Learning) is any kind of learning taking place within and beyond the traditional learning environment via wireless mobile devices which are able to move with learner to allow learning anytime, anywhere (Abu-Al-Aish, A., 2014). M-Learning is the use of portable computing devices with wireless networks enables mobility allowing teaching and learning to extend to spaces beyond the traditional classroom (Educause, 2018) for more flexibilities and new opportunities for interaction with technology like entering and leaving phone coverage (Vavoula, G., & Sharples, M., 2002) understanding perceptions should be the first step to implementing M-Learning on college campuses (Cheon, J., Lee, S., Crooks, S., & Song, J., 2012).

The availability of ICT resources (Mbwesa, 2002; Yann, S., 2017) can enhance learning. Accessibility and use of ICT (Reginald et al., 1996; Riel, 1998; Yann, S., 2017) allows undergraduate students to investigate more thoroughly the real. Despite the great potential of mobile devices (Al-Shahrani, H., 2016) to give students many benefits, students may be constrained by limited or no internet connectivity. There are several problems for the adoption of M-Learning (Zhan, L., 2011) with the higher rate of possessing mobile devices, students know little about the concept of M-Learning. M-Learning at university is still in the early stages of development (Park, 2011; Cheon, J., Lee, S., Crooks, S., & Song, J., 2012).

Learners need more access to academic-friendly devices and additional support (Lan, Q., Li, W., Chen, X., Sleem, A. M., & Farrukh, K., 2016) to integrate mobile technologies for learning.

2. Adoption Theory

There is a multitude of models (Oliveira, Martins and Lisboa, 2011; Rao, T., 2017) seeking to study the adoption of technology in the context of individualism; the adoption decision theory at the individual level is known for Technology Acceptance Model (TAM) by Davis in 1986 as a model explaining how the technology is accepted and used to reach the new technology and the adoption is mainly based on some external variable for their decision-making such as the perceived usefulness and the perceived ease of use (Davies, J., Foxall, G. R., & Pallister, J., 2002). TAM is adopted extensively showing that it contributes to the prediction of individual usage of technology (Ajzen, I., & Fishbein, M., 1980). The readiness of the undergraduate students and instructors refers to individual satisfaction and preparation in the online learning environment that largely based on the individual qualities such as technical skills, learning and teaching preferences, attitude towards technology and computer self-efficacy (Iqbal and Bhatti, 2015; Mutono, A., 2016). The attitude of the adoption comes from the two factors such the perceived ease of use and perceived usefulness which determine an individual's intention to adopt the innovation (Davis, 1989; Cheon, J., Lee, S., Crooks, S., & Song, J., 2012) and positively and significantly affect the undergraduate students' attitude (Haung et al., 2007; Al-Lozi, E., Al-Hujran, O., & Al-Debei, M., 2014) towards the adoption of technological innovation in M-Learning.

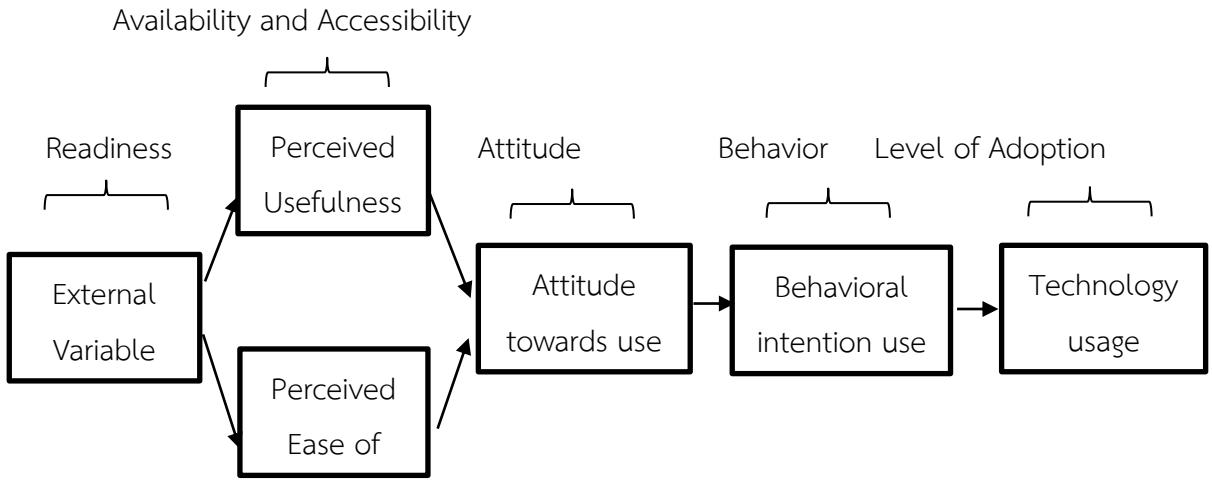



Fig. 1. The Technology Acceptance Model

The adoption of innovation, Everett, M. & Rogers, E. M., (1962) wrote the book named "Diffusion of Innovation" in the educational aspect talking about the decision-making model in accepting and diffusing the technological innovation and his last version the 5th edition published in 2003. The theory of diffusion of innovation is defined as the process by which an innovation is communicated through certain channels over time among members of a social

system; innovation is any new idea, new behavior, new product, new message i.e., a new thing that one brings for the adoption. The innovation-decision process is the process through which an individual passing from first knowledge of an innovation, to form an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision (Rogers, E. M., 1983).

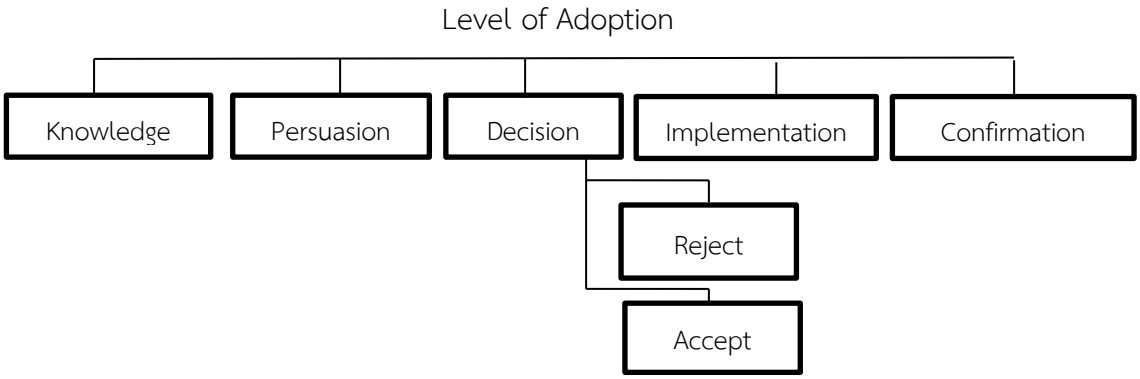
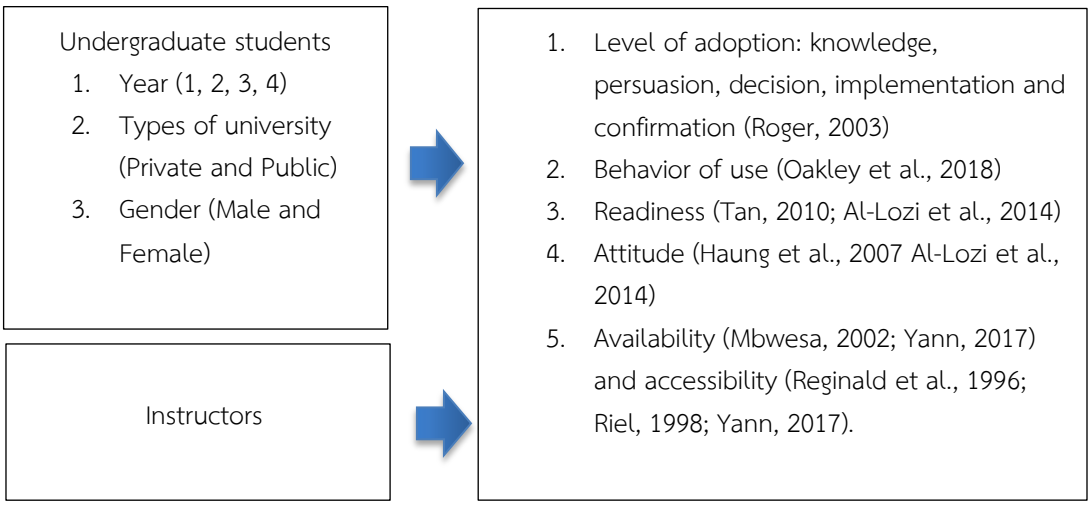



Fig. 2. Process of Technological Innovation Adoption

This is the conceptual framework taken from the constructivist work of Rogers, E. M (2003) that gives five characteristics of diffusion of innovation (DOI). This model of technology adoption addresses how and why end users choose to adopt a given innovation. The usefulness of such a theoretical framework allows for the understanding of the constructs associated with implementing technology in a less developed country like Cambodia.




## Objectives

The main objectives of this study are as follows:

1. To examine the level of the adoption of technological innovation in m-learning among undergraduate students and Instructors in Battambang, Cambodia

2. To explore the behavior for the use of technological innovation in m-learning by undergraduate students and instructors for higher education

3. To study the readiness of the undergraduate students and instructors for the adoption of technological innovation in m-learning.

4. To figure out the attitude of the undergraduate students and instructors for the adoption of technological innovation in m-learning.

5. To study about the availability and accessibility of m-learning among undergraduate students and instructors for teaching and learning.

**Methods**

This is survey research to figure out the undergraduate students and instructors' adoption of technological innovation in M-Learning in 5 aspects such as level of adoption, behavior of the use (timing, subjects, application, research database...), readiness, attitude, availability and accessibility. There are only two universities for this survey which one is private university and another is public university in Battambang, Cambodia. The population was sampling from 3494 undergraduate students and 45 instructors from year-1 to year-4 of the bachelor degree using Taro Yamane formula to the sample 359 undergraduate students and 40 instructors into only two groups (private vs public university) using the stratified random sampling based on the proportion from total population:

Table 1: Sample and Sample Stratified

| Name of University | Students | | Instructors | |
|---|---|---|---|---|
| | Population | Sample | Population | Sample |
| University of Battambang | 2496 | 256 | 31 | 27 |
| Dewey International University | 998 | 103 | 15 | 13 |
| Total | 3494 | 359 | 45 | 40 |

Research questionnaires are used to collect data from both instructors and undergraduate students adopted from several research concept and questionnaire and used as a primary data collection for this quantitative research that one questionnaire is for instructors and another questionnaire is for undergraduate students which are designed for closed multiple-choice answers and rating scale answers. Drafted questionnaires were created

and checked by five experts; the drafted questionnaires were checked for content validity. As per calculation in total, average values of IOC survey questionnaire for undergraduate students (IOC = 0.9193) and instructors (IOC = 0.9179). The reliability of the questionnaires was 0.929. The survey data of the undergraduate students is analyzed for comparing students in year 1, year 2, year 3 and year 4 using one-way ANOVA for one variable for four groups as mentioned and independent sample T-Test in comparison regarding between academic year of study and type of university.

**Results**

1. Undergraduate Students

From undergraduate students' survey results, the largest number of the undergraduate students' respondents are female 56.5% and male 43.5%. All undergraduate students are from bachelor degree from Year 1 (26.2%), Year 2 (24.8%), Year 3 (24.8%) and Year 4 (24.2). Their Majors are English (30.6%), Management (15.6%), Civil Engineering (8.6%), Education (8.1%), Law (8.1%), Business administration (7.2%), Agriculture (7.2%), Tourism (5%), Information Technology (4.7%), Rural Development (2.2%), Animal Science (0.8%) and Khmer Literature (0.6%) from Public University (71.3%) and Private University (28.7%). They use mobile devices such as Smart Phone (82.9%), Notebook (13.6%) and Tablet (3.6%) with Android (54.6%), iOS (34.3%) and Window OS (11.1%). Their adoption of technological innovation in M-Learning is at fair level as in the Table 2; there is no difference between academic year of study (significant result 0.219), major (significant result 0.171), type of university (significant result 0.253), type of mobile device (significant result 0.500) and type of mobile OS (significant result 0.813).

Table 2 Undergraduate Students' Result (Adoption of Technological Innovation in M-Learning)

| **Adoption of M-Learning** | **Perception** | | |
|---|---|---|---|
| | **M** | **S.D.** | **Result** |
| Level of Adoption | 3.05 | 0.61 | Fair |
| Level of Knowledge | 2.83 | 0.74 | Fair |
| Level of Persuasion | 3.06 | 0.74 | Fair |
| Level of Decision | 3.17 | 0.75 | Fair |
| Level of Implementation | 2.90 | 0.69 | Fair |

| | | | |
|---|---|---|---|
| Level of Confirmation | 3.28 | 0.79 | Fair |
| Readiness for M-Learning | 2.95 | 0.62 | Fair |
| Attitude for M-Learning | 3.33 | 0.66 | Fair |

Table 3 Undergraduate Students' Level of Adoption (One-Way ANOVA comparing between Year 1, Year 2, Year 3 and Year 4)

| Level of Adoption | SS | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Group | 1.67 | 3 | 0.558 | 1.481 | 0.219 |
| Within Group | 133.73 | 355 | 0.377 | | |
| Total | 135.40 | 358 | | | |

Table 4 Result of Undergraduate Students' Independent Sample T-Test for types of university in adoption of technological innovation in M-Learning

| Level of Adoption | n | Mean | SD | t | Sig. |
|---|---|---|---|---|---|
| Public University | 256 | 3.07 | 0.609 | 1.144 | 0.253 |
| Private University | 103 | 2.99 | 0.629 | | |

Table 5 Result of Undergraduate Students' Independent Sample T-Test for Gender in adoption of technological innovation in M-Learning

| Level of Adoption | n | Mean | SD | t | Sig. |
|---|---|---|---|---|---|
| Male | 156 | 3.06 | 0.685 | 0.212 | 0.832 |
| Female | 203 | 3.04 | 0.557 | | |

Regarding undergraduate students' response for behavior of use, subject of preference to study online are English (55.7%), Information Technology (16.2%), Law (8.6%), Management (14%), Civil Engineering (3.6%), Agriculture (2.8%), Education (2.2%), Tourism (0.8%), Architecture (0.8%), Rural Development (0.6%), History (0.6%), Animal Science (0.30%), Khmer Literature (0.3%) and Economics (0.3%) spending weekly hour for M-Learning one hour (25.1%), two hour (24.0%), three hours (18.1%), four hours (8.4%) and more than four (24.5%). Their internet access is Mobile Internet (73.3%), Home Wi-Fi (16.0%), University Wi-Fi (6.1%) and Public Wi-Fi (4.6%); there are only 36.5% using online educational game while 63.5% never use it. Their main social media network for learning and communication on mobile devices are Facebook and Messenger (70.4%), Telegram (17.8%), E-mail (16.2%), Instagram (8.1%), Line (3.5%) and Twitter (1.9%) with websites using for M-Learning are YouTube (77.7%), Khmer Academy (16.1%), FutureLearn (2.5%), EdX (1.2%), Cognitive Class (1%), Coursera (1%) and Udemy (0.5%). The research database they use for M-Learning are Google Scholar (62.8%), Google (26.4%), Research Gate (8.2%), SpringerLink (1.1%), Thai Digital Collection (1.1%), ProQuest Dissertations and Theses Global (0.5%); weekly hour for research on mobile devices is one hour (24.2%), two hours (23.1%), three hours (20.1%), four hours (9.5%) and more than four hours (23.1%). Among the response from undergraduate students, it is shown that 90.3% using Google for Education (Google Drive, Google Classroom…) while 9.7% claimed for no use.

The responses of undergraduate students on the availability supporting the adoption of technological innovation in M-Learning, survey results showed that the availability of electricity (94.7%), internet access (92.5%), university online learning system (56.3%), university smart classroom (52.4%), workshop for online education (58.5%). Their accessibility supporting the adoption of technological innovation in M-Learning are internet (71.3%), electricity (76.6%), research database (73.5%), online educational media (67.4%), and university library system (68.8%).

2. Instructors

From instructors' survey results, most of the Instructors' responses are Male (92.5%) and Female (7.5%) from teaching major like English (35.0%), Business Administration (10.0%), Rural Development (10.0%), Information Technology (7.5%), Management (7.5%), Law (5.0%), Agriculture (5.0%), Architecture (5.0%), Animal Science (5.0%) and Tourism (5.0%), Civil Engineering (2.5%) and History (2.5%) from Public University (67.5%) and Private University (32.5%). They use mobile devices such as Smart Phone (55.1%), Notebook (40.6%) and Tablet (4.3%) with Android (41.3%), Window OS (33.3%) and iOS (25.4%). Their adoption of technological innovation in M-Learning is at fair level as in the Table 3.

Table 6 Instructors' Result (Adoption of Technological Innovation in M-Learning)

| **Adoption of M-Learning** | **Perception** | | |
|---|---|---|---|
| | **M** | **S.D.** | **Result** |
| Level of Adoption | 3.53 | 0.81 | Good |
| Level of Knowledge | 3.26 | 0.82 | Fair |
| Level of Persuasion | 3.52 | 1.05 | Good |
| Level of Decision | 3.69 | 0.97 | Good |
| Level of Implementation | 3.26 | 0.84 | Fair |
| Level of Confirmation | 3.90 | 0.85 | Good |
| Readiness for M-Learning | 3.35 | 0.58 | Fair |
| Attitude for M-Learning | 3.81 | 0.86 | Good |

Regarding instructors' response for behavior of use, subject of preference to use online in assistance to teaching are English (35.0%), Information Technology (15.0%), Business Administration (10.0%), Management (7.5%), Law (5.0%), Agriculture (5.0%), Rural Development (5.0%), Tourism (5.0%), Architecture (5.0%), animal science (5.0%) and History (2.5%) spending weekly hour for M-Learning one hour (22.5%), two hours (24.0%), three hours (27.5%), four hours (15.0%) and more than four hours (20.0%). Their internet access is mobile internet (64.5%), Home Wi-Fi (20.0%), University Wi-Fi (11.1%) and Public Wi-Fi (4.4%); there is only 7.5% of them using online educational game for teaching while 92.5% never use it. The social media network that instructors use for teaching and communication are Facebook and Messenger (41.2%), Telegram (26.5%), E-mail (26.5%), and Instagram (5.8%). Among website that Instructors use the most for teaching and learning is YouTube (57.4%), Cognitive Class (13.0%), Edx (11.1%), Khmer Academy (7.4%), Future Learn (7.4%) and Coursera (3.7%). The research database that instructors use for research and teaching on mobile devices are Google Scholar (63.4%), Research Gate (11.5%), Google (9.5%), SpringerLink (3.9%), ProQuest Dissertations and Theses Global (3.9%), Science Direct (3.9%) and EBSCOhost (3.9%) spending

weekly for research one hour (20.0%), two hours (35.0%), three hours (15.0%), four hours (17.5%), and more than four hours (12.5%). Only 5.0% of them using Google for Education (Google Drive, Google Classroom…) while 95.0% claimed for no use.

The availability supporting the adoption of technological innovation in M-Learning are electricity (100.0%), internet access (95.0%), university online learning system (42.5%), university smart classroom (35.0%), and workshop for online education (52.5%) while the accessibility supporting the adoption of technological innovation in M-Learning are internet (52.5%), electricity (87.5%), research database (92.5%), online educational media (77.5%), and university library system (47.5%).

## Discussion

1. Undergraduate Students

M-Learning is positive (Oakley, G., Pegrum, M., & Kheang, T., 2018) among Cambodian students even though there were some challenges regarding the app design. Similarly, reflecting to this survey that the undergraduate students positively adopt the technological innovation at fair level. Therefore, M-Learning is so far limited officially in higher education in Battambang, Cambodia, but undergraduate students adopted well with their mobile devices and much better if they can get more support from instructors, universities and Ministry of Education, Youth and Sport (MoEYS). It is good that undergraduate students' adoption is in line with the existing of mobile phone usage as report in September 2016 claiming to over 96% of Cambodian (Phong, K., Srou, L., & Sola, J, 2016). The research findings (Tan, 2010; Al-Lozi, E., Al-Hujran, O., & Al-Debei, M., 2014) showed that the perceived usefulness, perceived ease of use and subjective norm in line with Technology Acceptance Model (TAM) by Davis in 1989 positively associated with intention to adopt mobile learning. Therefore, level of knowledge, persuasion, decision, implementation and confirmation, behavior of use, readiness and attitude towards the adoption of technological innovation in M-Learning, availability and accessibility of technological innovation in M-Learning is positive in this survey results at fair level. Therefore, the use of technological innovation in M-Learning related to their majors and the most popular subjects to use technological innovation in M-Learning is English and information Technology (IT) because these subjects play very important role in allowing undergraduate students to access M-Learning that English is an international language and Information Technology (IT) is main skill to access M-Learning in the field of Information and Communication Technology in Education (ICT in Education). According to the (Stead, 2005; Omar, Enas and Mutaz, 2014) using mobile technology in education can contribute for collaboration and communication of practice, so from the survey results show that undergraduate students are positive behavior of use as it helps them for learning conveniently as well as more communication and research through various channel. The positive behavior of use technological innovation in M-Learning lead to the undergraduate students' adoption

of the technological innovation of M-Learning at higher education in Battambang, Cambodia. The readiness of the undergraduate students and instructors refers to individual satisfaction and achievement in the online learning environment that largely based on the individual qualities such as technical skills, learning and teaching preferences, attitude towards technology and computer self-efficacy (Iqbal and Bhatti, 2015; Mutono, A. 2016). Furthermore, (Haung et al., 2007; Al-Lozi, E., Al-Hujran, O., & Al-Debei, M., 2014) showed that perceived usefulness and perceived ease of use positively and significantly affect the undergraduate students' attitude towards the adoption of technological innovation in M-Learning that positive attitude can result more use of M-Learning. Similar to this findings, this survey results also show that the link between the positive readiness and attitude lead to the undergraduate students' adoption of technological innovation in M-Learning at higher education in Battambang, Cambodia. According to research finding (Mbwesa, 2002; Yann, S., 2017) the availability of ICT resources can enhance learning, so the availability of technological innovation in M-Learning is thus important towards the adoption of technological innovation in M-Learning. M-Learning also has some challenges for the availability and accessibility of mobile device and internet connection. Therefore, understanding perceptions toward M-Learning should be the first step to implementing M-Learning on college campuses (Cheon, J., Lee, S., Crooks, S., & Song, J., 2012). However, M-Learning at university is still in the early stages of development (Park, 2011; Jongpil et al., 2012). Based on the research survey results, technological innovation in M-Learning is available on demand lead to the adoption of technological innovation in M-Learning among undergraduate students at higher education in Battambang, Cambodia. Accessibility and use of ICT (Reginald et al., 1996; Riel, 1998; Yann, S., 2017) allows undergraduate students to investigate more thoroughly the real world; the accessibility of technological innovation in M-Learning helps undergraduate students able to use M-Learning that will benefits them. Learners need more access to academic-friendly devices and additional support (Lan, Q., Li, W., Chen, X., Sleem, A. M., & Farrukh, K., 2016) to integrate mobile technologies for learning as convenience, flexibility, engagement, and interactivity are greatly improved to make M-Learning more attractive to them. Therefore, survey results from this study that good accessibility of technological innovation among undergraduate students at higher education in Battambang, Cambodia also lead to the adoption of this technological innovation in M-Learning.

2. Instructors

M-Learning in Cambodia (Oakley, G., Pegrum, M., & Kheang, T., 2018), M-Learning is positive among Cambodian teachers. In line with this research findings, instructors are so positive in adoption at good level of technological innovation in M-Learning at higher education in Battambang, Cambodia. The research findings (Tan, 2010; Al-Lozi, E., Al-Hujran, O., & Al-Debei, M., 2014) showed that the perceived usefulness, perceived ease of use and

subjective norm in line with Technology Acceptance Model (TAM) by Davis in 1989 positively associated with intention to adopt mobile learning. Therefore, level of knowledge, persuasion, decision, implementation and confirmation, behavior of use, readiness and attitude towards the adoption of technological innovation in M-Learning, availability and accessibility of technological innovation in M-Learning is good in this survey results support that there is the good adoption of technological innovation in M-Learning among instructors at good level at higher education in Battambang, Cambodia. As stated by the research findings (Stead, 2005; Al-Lozi, E., Al-Hujran, O., & Al-Debei, M., 2014) that using mobile technology in education can contribute for collaboration and communication of practice, so from the survey results show that instructors at higher education in Battambang, Cambodia are positive behavior of use towards the adoption of technological innovation in M-Learning as it helps them for teaching and interacting comfortably as well as researching through various channels. The positive behavior of use technological innovation in M-Learning lead to the instructors' adoption of the technological innovation of M-Learning at higher education in Battambang, Cambodia. Following the Research Finding (Haung et al., 2007; Al-Lozi, E., Al-Hujran, O., & Al-Debei, M., 2014) that perceived usefulness and perceived ease of use positively and significantly affect the attitude towards the adoption of technological innovation in M-Learning, it does support this survey result for the instructors' adoption of technological innovation in M-Learning that the positive readiness and attitude of instructors lead to the well adoption of technological innovation in M-Learning. Research finding (Mbwesa, 2002; Yann, S., 2017) shows that the availability of ICT resources can enhance learning; the availability of technological innovation thus helps instructors to the adopt of technological innovation in M-Learning at higher education in Battambang, Cambodia based on this survey results. Accessibility and use of ICT (Reginald et al., 1996; Riel, 1998; Yann, S., 2017) lead to the investigation more thoroughly of the real world; the accessibility of technological innovation among instructors at higher education lead to the adoption of technological innovation in M-Learning for better quality of instructions.

## Conclusion

1. Conclusion

After going through the discussion on the survey research findings, the conclusion can be made that all of the undergraduate students and instructors at higher education in Battambang, Cambodia have at least one mobile device mainly smart phone with Android mobile operating system with the research findings based on the research objectives as below:

1. The level of adoption: the undergraduate students fairly adopted the technological innovation in M-Learning at higher education in Battambang, Cambodia and there is no significant difference on the adoption in the condition of gender, year of study,

type of university while the instructor adopted well. It should be noticed that both undergraduate students and instructors seem to response less mean range scoring for level of knowledge and level of implementation in adoption of technological innovation in M-Learning meaning that there is still limited how the university educated and encouraged the undergraduate students for the implementation of M-Learning. Thus, the university shall create the training or workshop program to enhance their knowledge as well as how to implement for the effective M-Learning for their learning and teaching.

2. Behavior of the use: the undergraduate students and instructors have good behavior of using the technological innovation in M-Learning. Most of the undergraduate students and instructors used social media like Facebook and FB Messenger following by Telegram for communication, learning and teaching and mostly YouTube and Khmer Academy as website for M-Learning followed by FutureLearn, EdX, Cognitive Class, Coursera and Udemy. Regarding to the online research database, they use Google and Google Scholar, Research Gate, SprinkerLink, Thai Digital Collection, and ProQuest Dissertations and Theses Global. The most popular subject to research for them is English and Information Technology (IT). They spend at least one hour per week for M-Learning and online research mostly on their smart phone on Android Operating System with their own mobile internet package. They don't use much the online educational game like Kahoot for learning and teaching. To sum up, it is noticed that they have really good behavior for using the available mobile device, internet and online educational resources as the start for the adoption of technological innovation in M-Learning. It can play a good role for their future learning and teaching in addition to their traditional classroom if the university supports for M-Learning in their curriculum and motivate them to participate with their good behavior for M-Learning. Anyway, as most of them use foreign system as website for M-Learning, the university shall initiate to launch Cambodia's M-Learning for their own university programs as well as create the worldwide link to the international research database in response of the needs of the academic research in Cambodia.

3. Readiness: the undergraduate students and instructors are fairly ready to adopt the technological innovation in M-Learning. They believe that they are in favor of utilizing M-Learning in their coursework with the good internet and mobile device capable for M-Learning, the adequate technical skills for using mobile device, the sufficient knowledge and full information in using mobile devices for educational purposes and the good knowledge of information technology. With this opportunity of their readiness, university shall take this chance to start M-Learning for the educational technology development at higher education in Battambang, Cambodia and if possible, launch the national cyber university network in line with Battambang as one of smart city networks of ASEAN and the inclusive and equitable quality education of Sustainable Development Goals (SDGs) and Incheon Declaration for Education in 2030.

4. Attitude: the undergraduate students and instructors have positive attitude at fair level for the adoption of technological innovation in M-Learning. They are confident that using mobile devices for their learning and teaching is useful and save costs and time with the flexibility of time to improve the quality of their learning and teaching. They are positively supporting M-Learning for more use at university and they prefer to communicate for their homework and assignment in electronic form. Again, good attitude can lead to the successful adoption of technological innovation in M-Learning at least at fair or good level. The university shall use this opportunity to motivate them for more engagement in M-Learning as well as in the future development of M-Learning for testing and implementation.

5. Availability and accessibility: the technological innovation in M-Learning at higher education in Battambang, Cambodia for the undergraduate students and instructors is fairly available and accessible on demand. There are available electricity and internet access, but it is limited for university online learning system, smart classroom and workshop for online education. Similarly, both of them can get access well for electricity, research database and online educational media, but internet access and university library research system is still limited and needed to improve. With this data, university shall enhance their library research system and internet to be easily accessible by both undergraduate students and instructors. Online learning system, smart classroom and workshop for online education shall be focused in the next educational development plan as the preparation for the future adoption of technological innovation in M-Learning as well as for the future educational technology launch in Cambodia.

2. Suggestion

Upon the finding results of this research survey from the undergraduate students and instructors at higher education in Battambang, Cambodia, there are some recommendations for implication from this research as the following:

1. It is recommended for higher education in Battambang, Cambodia to focus on supporting the adoption of technological innovation in M-Learning by launching the project towards M-Learning in order to motivate both undergraduate students and instructors to get more knowledge about M-Learning and more implementations in their academic programs.

2. There is the need for improvement on the internet access in Battambang, Cambodia as Battambang is considered one of three ASEAN smart cities from Cambodia soon. As undergraduate students and instructors mostly depend on the mobile network, university Wi-Fi and public Wi-Fi shall be improved for further online education with technological innovation in M-Learning. As per Cambodia's ICT in education policy is supported by national education strategic plan (ESP) (MoEYS, 2004b; Yann, S., 2017), universities shall implement this policy for equitable access, quality, efficiency and capacity building among instructors and undergraduate students.

3. There is the need for Cambodia to create the national cyber university programs and center as inter-university joining project for online education and research database at higher education, especially technological innovation in M-Learning. It is really important for Ministry of Education, Youth and Sport (MoEYS) and all universities throughout Cambodia to cooperate for better information and communication technology in education at higher education.

## Refernence

Abu-Al-Aish, A. (2014). *Toward mobile learning deployment in higher education.* N.p.: Brunel University, School of Information Systems, Computing and Mathematics.

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

Al-Lozi, E., Al-Hujran, O., and Al-Debei, M. (2014). Get Ready to Mobile Learning: Examining Factors Affecting College Students' Behavioral Intentions to Use M-Learning in Saudi Arabia. *Jordan Journal of Business Administration*, 10(1), 111–128. Retrieved 2019, Jan 20, from https://doi.org/10.12816/0026186.

Al-Shahrani, H. (2016). *Investigating the determinants of mobile learning acceptance in higher education in Saudi Arabia. Northern Illinois University*. Retrieved 2019, Jan 20, from http://commons.lib.niu.edu/handle/10843/18618.

Cheon J., Lee S., Crooks S., and Song J. (2012). An Investigation of Mobile Learning Readiness in Higher Education Based on the Theory of Planned Behavior. *Computers & Education,* 59, 1054–1064.

Davies, J., Foxall, G. R., and Pallister, J. (2002). Beyond the Intention–Behaviour Mythology: An Integrated Model of Recycling. *Marketing Theory,* 2(1), 29–113. Retrieved 2019, Jan 20, from https://doi.org/10.1177/1470593102002001645.

Educause. (2018). *Mobile Learning.* Retrieved 2019, Jan 20, from https://library.educause.edu/topics/teaching-and- learning/mobile-learning.

Fitts, T. H. (2015). *Teacher implementation of mobile learning initiative at a sixth grade school: a phenomenological study.* N.p.: Liberty University.

Heng, K. (2012). College Student Involvement in English Language Learning in Cambodia. *Journal of International Development and Cooperation,* 19, 11.

Khieng, S., Srinivasa, M., and Chhem, R. (2015). *Cambodia Education 2015 Employment and Empowerment.* Retrieved 2019, Jan 20, from . https://cdri.org.kh/wp-content/uploads/FP2-edu2015-e.pdf

Lan, Q., Li, W., Chen, X., Sleem, A. M., and Farrukh, K. (2016). *Design and implementation of a novel mobile-optimized remote laboratory platform for mobile learning.* Retrieved 2019, Jan 20, from https://doi.org/10.13140/RG.2.2.28230.57928

Mutono, A. (2016). An investigation of Mobile learning readiness for Post-School Education and Training in South Africa using the Technology Acceptance model. *International Journal of Education and Research.* 4, 25-34.

Oakley, G., Pegrum, M., & Kheang, T. (2018). *An evaluation of the integration of m-learning in Total Approach for Children Plus (TRAC+): Enhancing literacy of early grade students in Cambodia. World Vision Press.* Retrieved 2019, Jan 20, from https://allchildrenreading.org/wordpress/wp-content/uploads/2018/05/TRAC-Report-Web.pdf.

Phong, K., Srou, L., and Sola, J. (2016). *Research Report: Phones and Internet in Cambodia 2016.* N.p.: Asia Foundation.

Pou, S., Sok, S., Courtney, W., Alice, B., Kevin, N., and Khoun, T. (2016). *Doing Research in Cambodia: Making Models that Build Capacity*. N.p.: Cambodian Institute for Cooperation and Peace.

Rao, T. (2017). *Factors critical to the organisational adoption of artificial intelligence: A South African perspective*. N.p.: University of Pretoria.

Rogers, E. M. (1983). *Diffusion of innovations* (3rd ed). N.p.: Free Press.

_____. (2003). *Diffusion of innovations* (5th ed). N.p.: Free Press.

UNESCO. (2015). *Education 2030 Incheon Declaration and Framework for Action.* Retrieved 2019, Jan 20, from http://uis.unesco.org/sites/default/files/documents/education-2030-incheon-framework-for-action-implementation-ofsdg4-2016-en_2.pdf

Van Akkeren J. and Cavaye, A., (1999). *Small Business IT Market Readiness and Overcoming Their Fear Factor*. Proceedings of the 10th Australiasian Conference on Information Systems (ACIS99, p1071-1083). Wellington: New Zealand.

Vavoula, G., and Sharples, M. (2002). *KLeOS: a personal, mobile, knowledge and learning Organisation system*. N.p.: n.p. (In Thai)

Yann, S. (2017). *A study of Students' and ICT Teachers' Perception on Implementation for ICT for Teaching and Learning in Upper Secondary School in Phnom Penh, Cambodia.* Surin: Surindra Rajabhat University. (In Thai)

Zhan, L. (2011). A Status Research on Mobile Learning of College Students. ProQuest Dissertations Publishing.

**Author**

**Mr.Pok Panhavuth**

Faculty of Education, Surindra Rajabhat University

Battambang Province, Cambodia.

e-mail: pokpanhavuth@gmail.com

**Dr.Nootjarie BOONGET**
Faculty of Education, Surindra Rajabhat University
Surin Province, Thailand.
e-mail: nootboonget@gmail.com

**Dr.Prachit Intaganok**
Faculty of Education, Surindra Rajabhat University
Surin Province, Thailand.
e-mail: drprachit@srru.ac.th