USING THE TECHNOLOGY ACCEPTANCE MODEL IN UNDERSTANDING STAFF ACCEPTANCE AND ATTITUDES TO USE LECTURE CAPTURE SYSTEM

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Abstract- Lecture capture is a process in which video recordings of live lectures are shared with students via the internet. Most of the higher education institutions in Hong Kong show a great interest in the adoption of this modern technology to learning and teaching. Determining the significance of a particular new technology and predicting the success of implantation is essential prior to its adoption. This research aimed to utilize the Technology Acceptance Model (TAM) in an attempt to assist Vocational Training Council in predicting the staff acceptance, attitudes and behavioral intention to use Lecture Capture System (LCS). This study proposed a theoretical framework that includes the core constructs in TAM: namely, perceived ease of use, perceived usefulness, attitude towards using, and behavioral intention to use. An additional external variable, the lack of LCS availability, was also adopted. An online questionnaire based on the TAM was developed and used to solicit information from 86 academic staff. The overall research model suggests that all mentioned variables either directly or indirectly affect the overall behavioral intention to use an LCS. Initial findings suggest the applicability of using TAM to measure the behavioral intention to use an LCS. Further, the results confirm the original TAM's findings.

Keywords- Technology Acceptance Model; Lecture Capture; Vocational Education; Panopto

I. INTRODUCTION

The use of lecture capture technology to record lectures and seminars has become increasingly common around the world in recent years. Lecture capture has also been cited [1] as one of the most transformative technologies to impact Higher Education Institutions. Most students find lecture capture is a useful learning tool which reduces their pressure of note-taking in class. In addition, English is not the first language for most students in Vocational Training Council (henceforth VTC), this technology is particularly helpful for them to revisit the lecture after class at their own pace. However, teaching staff remain concerned about the impact of lecture capture on attendance, student interactions and changes to lecture format deemed antagonistic to current teaching practices. Therefore, staff acceptance and attitudes have been regarded as one of the major determinants of integrating lecture capture into the classroom. Without teachers' acceptance of technology, it is almost impossible to develop educational technology projects [2]. This is because teachers are both gatekeepers of technology and the most important sources of delivering information in the classrooms. Most previous studies focus on measuring the attitude of academic staff towards a Lecture Capture System (henceforth LCS) which is already implemented for several years, very limited research literature examines early user acceptance and attitudes of an LCS in the pilot stage. In other words, most of the existing research focuses on the population who have prior experience in using LCS. Therefore, as a largest vocational and professional education and training provider in Hong Kong, it is worth to understand early user acceptance and attitudes on using an LCS in a vocational education institution setting.

A. Background

In 2014, the Centre for Learning and Teaching at VTC in Hong Kong began initial experiments with video recording of lectures to support flexible and blended learning. A series of pre-pilot trials has also been initiated to evaluate the potential lecture capture solutions since then. The trials focus on comparison of existing video recording services at VTC against potential solution on their usability, flexibility, interactivity and functionality. There are various lecture capture systems in the market such as Panopto, Mediasite, Reach, Echo360 and Tegrity. Finally, Panopto LCS has been adopted for a pilot period from March 2015 to Feb 2016. The Panopto LCS has been chosen because it provides most comprehensive features, which includes computer screen recording, multi-camera recording, live webcasting, scheduled recording, video analytics and video trimming. Further, it has a unique feature which make it stand out from others is that it could extract the texts from PowerPoint slideshow as keywords. Learner could then easily find the required video by searching the keywords.

Recordings made with this system can be viewed in the web browser via desktop computer, smart phone or tablet. There are two main ways in which the video would be reviewed, either through their own video

management platform or Learning Management System such as Moodle.

Two lecture theatres in different VTC campuses have been chosen to install the Panopto LCS. The annual licensing fee of the software has been waived for the first year and VTC was only required to invest in the essential hardware to experience the technology.

B. Objective

The main objective of this study is to to utilize the Technology Acceptance Model (henceforth TAM) [3] in an attempt to assist VTC in predicting the staff acceptance, attitudes and behavioral intention to use an LCS. The research questions were guided by the TAM which was also used in the designing of the research instrument. The findings of this study were turned to be a consideration for the continued use of an LCS in VTC campuses.

II. LITERATURE REVIEW

Lecture capture is a general term for a wide variety of techniques to maintain artifacts of classroom activity and distribute them to students [4]. Three potential streams of capture are: audio of the lecture and class discussions; visual resources including slides and screen captures; and video of the actual classroom [5]. Audio recordings form the simplest version of lecture capture, but these are often paired with the presentation slideshow [6]. The instructor conducts the lecture as normal using a microphone and computer in the lecture theatre, the lecture materials from whiteboard, slideshows, screenshots and instructor's speech and movement will then be captured by the LCS. Those input sources are captured separately from the live lecture, and then the learners could view the instructor's video with synchronized slideshow side by side afterward. Students can study at their own pace by using play, rewind, pause and stop function to control the playback. This control allows students to relax in lectures and take notes later during lecture playback [7] and review elements that they may have missed in the live lecture [4]. They could focus on important concepts presented during class because they could access the lectures at any time to build a more extensive set of notes. Lecture capture has potential benefits for students' learning and grades [9]. Students report that they appreciate the flexibility of lecture capture because they can access it anywhere and anytime. It provides convenience to students, especially to those who miss the class or want to catch up on the course content. Students perceive that they have control over their learning and that lecture capture enhances their performance [10]. The playback of lecture recordings permits no immediate dialogue with the instructor for clarification or exploration of the topic at hand and recordings are thus intended to supplement but not replace live lectures [11]. University faculty report fears that recordings will lead to lower attendance in the face-to-face lectures and thus lesser opportunity for classroom discussion [12]. Students may require more self-discipline when lecture recordings are present [10] and some of them are prone to skip more classes when recordings are available [13]. In another case, lecture capture resulted in no negative impact on attendance [14]. When absences occur, most students are primarily triggered by other factors and the recordings simply allowing them to compensate the lesson [15]. A high percentage of studies on LCS have targeted learner usage of the system. Hence, the previous studies did not target the intentions and behaviours of LCS users. Most importantly, use of the TAM within LCS in Hong Kong vocational education setting is virtually non-existent. Moreover, previous studies focus only on staff that have already utilized an LCS. The potential users of LCS, however, are not considered.

III. THEORETICAL FRAMEWORK

A. Technology Acceptance Model (TAM)

There have been various models developed for integrating technology into educational settings, one of which and the most popular is TAM. The TAM (see Figure 1) is a model devised by Fred Davis on how users of a technology will come to accept and use it [16]. The model states that there are many contributing factors that will influence a user on how they use a new kind of technology. The three main factors predicting computer use are Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Intention to Use [17]. In the context of lecture capture, PU and PEOU are two most key factors to finding out how the academic staff perceive this technology.

PU and PEOU are hypothesized to be the fundamental determinants of user acceptance. PU is defined as the degree to which a person believes that using a certain technology would enhance his or her job performance. This is grounded on the proposition that people would tend to utilize an application when it is useful in performing his/her tasks. In the case for teachers, technology use in classroom settings would be perceived as useful when a teacher develops a belief that this will help him/her teaching and having more control over knowledge transaction [18]. On the similar background, PEOU is defined as the degree to which a person believes that using a certain technology would be free from effort. People with high intrinsic motivations towards using a technology may underestimate the difficulties that the usage of a certain technology entails [19].

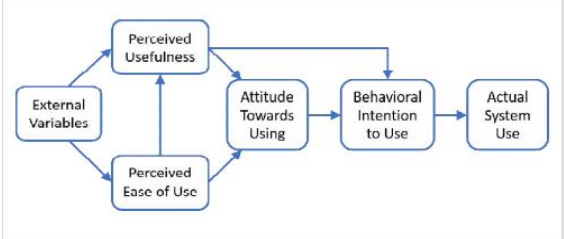

Figure 1. The Technology Acceptance Model (TAM)

B. Studies on educational technology using TAM

The TAM has also been widely used in technology acceptance research in educational settings since 1989 [20-23]. Lee, Cheung & Chen [23] examined students' acceptance of an Internet-based learning medium. The result showed that both PU and PEOU impact the students' intention to use a technology significantly and directly. Shum, Land & Dick [24] investigated students' potential acceptance of podcasting as an educational tool using TAM. Students expressed a strong intention to use a desktop computer to access podcasts made available by their instructors. Podcasts deliver the audio content in a timely manner and at low cost. Perceived usefulness was found to have significant relationships with predicting intention to use podcasts.

Haugstvedt and Krogstie [25] used TAM as a theoretical foundation to examine users' acceptance of a mobile augmented reality application with historical photographs and information about a historical street. The results show that both perceived usefulness and perceived enjoyment has a direct impact on the intention to use mobile augmented reality applications for cultural heritage.

TAM is adopted in this study because there is no similar research using TAM to explore the staff acceptance, attitudes and behavioral intention to use an LCS.

IV. RESEARCH MODEL AND HYPOTHESES

TAM can be used to predict and explain the behavioral intention to adopt a new technology among inexperienced and experienced users [26]. Shih [27] also noted that TAM can be applied prior to the adoption of a new technology. The research model (see Figure 2), is consist of the TAM core constructs and moderator. The following section discusses the development of relevant hypotheses H1 to H7.

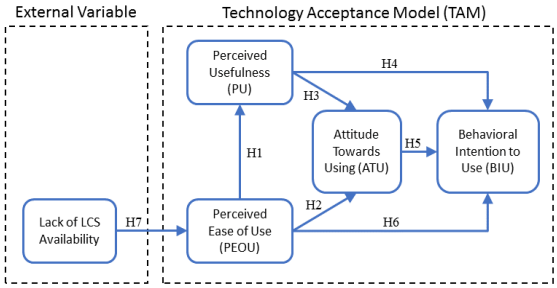

Figure 2. Research model of hypotheses

A. Hypotheses in relation to TAM variables

As shown in Figure 1, TAM proposed the following relationship between its constructs: a) Intention to use is positively affected by attitude toward using and perceived usefulness; b) Attitude toward using is positively affected by perceived usefulness and perceived ease of use; and c) perceived usefulness is directly affected by perceived ease of use. In this study, perceived usefulness is defined as the degree to which an academic staff believes that using an LCS would enhance his or her job performance, while perceived ease of use is defined as the degree to which an academic staff believes that learning to use an LCS requires a relatively low degree of effort. Therefore, the relationships between perceived ease of use, perceived usefulness, attitude toward using, and intention to use an LCS are hypothesised as the following:

1) Perceived ease of use has a positive effect on perceived usefulness of an LCS.
2) Perceived ease of use has a positive effect on attitudes towards using an LCS.
3) Perceived usefulness has a positive effect on attitudes towards using an LCS.
4) Perceived usefulness has a positive effect on intention to use an LCS.
5) Attitude towards using has a positive effect on intention to use an LCS.
6) Perceived ease of use has a positive effect on intention to use an LCS.

B. Hypotheses on the relationship between lack of LCS availability and TAM variables

The ease of use and usefulness constructs may not be sufficient, and therefore other variables may need [28]. Thus, after reviewing the relevant studies, this study suggests adding lack of LCS availability as an external variable and it moderates the original TAM variables. At the pilot stage, LCS was not available for participants. This study proposes that a lack of LCS availability has a negative impact on perceived ease of use. Therefore, the relationship between lack of LCS availability and perceived ease of use is hypothesised as following:

7) Lack of LCS availability has a negative effect on the perceived ease of use of an LCS.

V. RESEARCH METHOD

A. Questionnaire

An online questionnaire was developed for data collection. Because the study was quantitative in nature, the questionnaire can examine the relationship between variables proposed in the research model. The online questionnaire was hosted in intranet and only VTC staff can login to answer the questionnaire. The research instrument contained 18 items which were related to TAM constructs. It incorporated a five-point Likert response scale ranging from "strongly disagree (1)" to "strongly agree (5)". To ensure content validity, items were designed based on previous literature review and the original measurement scales with some modifications to fit the context of this study. The respondents should be able to complete the questionnaire in 10 minutes.

B. Measuring TAM constructs

As shown in Table 1, there are 18 items measured in accordance with the current study's research model. The measured items include perceived ease of use (7 items), perceived usefulness (6 items), attitude towards using (3 items) and behavioral intention to use (2 items).

C. Data collection

The questionnaire was made available from 17 to 29 Feb 2016. It was distributed to 3,300 academic staff by email and they were VTC teaching staff working in different campuses. Out of the 3,300, only 86 valid responses were recorded. The overall response rate was 2.6%.

D. Procedure

In accordance with the hypotheses of the present study, a website was developed for introducing LCS to participants. The website consisted three sections. The first section provided a general overview about the LCS pilot project and described key features of LCS. The second section provided a quick start guide of Panopto LCS in video and PDF format. A hyperlink of demo lecture video recorded by Panotpo LCS was also provided in the third section. The participants could view the video before taking the survey.

Table 1: Questionnaire

Section I: Perceived Ease of Use (PEOU)		
1.	I feel that using an LCS would be easy for me	PEOU1
2.	I feel that my interaction with LCS would be clear and understandable	PEOU2
3.	I feel that it would be easy to become skillful at using LCS	PEOU3
4.	I would find LCS to be flexible to interact with	PEOU4
5.	Learning to operate LCS would be easy for me	PEOU5
6.	It would be easy for me to get LCS to do what I want to do	PEOU6
7.	I feel that my ability to determine LCS ease of use is limited by lack of LCS availability	PEOU7
Section II: Perceived Usefulness (PU)		
8.	Using LCS in my teaching would enable me to accomplish tasks more quickly	PU1
9.	Using LCS in my teaching would improve my performance	PU2
10.	Using LCS in my teaching would increase my productivity	PU3
11.	Using LCS would enhance my teaching effectiveness	PU4
12.	Using LCS would make me easier to teach students	PU5
13.	I would find LCS useful in my teaching	PU6
Section III: Attitude Towards Using (ATU)		
14.	I believe it is a good idea to use LCS in teaching and learning	ATU1
15.	I like the idea of using LCS in teaching and learning	ATU2
16.	Using LCS in teaching and learning is a positive idea	ATU3
Section IV: Behavioral Intention to Use (BIU)		
17.	I plan to use LCS for teaching in the future	BIU1
18.	Assuming that I can access to an LCS, I intend to use it	BIU2

VI. DATA ANALYSIS AND RESULTS

A. Reliability

All the measures were analyzed to determine the reliability of the measurement scales. Reliability assessment was done using Cronbach's Alpha [29]. Reliability concerns internal consistency between multiple measurements of variables, and Cronbach's Alpha is commonly used to measure it [30].

In this study, the reliability assessment was done using Minitab version 17. As shown in Table 2, alpha coefficients for the constructs ranging from 0.8995 to 0.9767 were all well above the 0.70 standard of reliability, which means the constructs were considered to have internal consistency reliability and the survey was considered reliable [31].

Table 2. Reliability analysis using Cronbach's Alpha

Scale	Number of Items	Cronbach's Alpha
Perceived Ease of Use (PEOU)	7	0.9739
Perceived Usefulness (PU)	6	0.9767
Attitude Toward Usage (ATU)	3	0.9244
Behavioral Intention to Use (BIU)	2	0.9340
Overall reliability	18	0.8995

B. Hypotheses testing

The correlation analysis was conducted to examine the relationship between the variables used within this study, and therefore to decide whether to accept or reject the null hypotheses according to the correlation analysis result_ in Table 3.

Table 3. Correlations between TAM variables

Correlations					
Factors		***PU***	***ATU***	***BIU***	***PEOU***
PEOU	r-value	0.544	0.536	0.265	
	p-value	0	0	0	
PU	r-value		0.586	0.492	
	p-value		0	0	
ATU	r-value			0.368	
	p-value			0.035	
Lack of LCS availability	r-value				0.274
	p-value				0.029

PEOU: Perceived ease of use; PU: Perceived usefulness;
ATU: Attitude toward usage; BIU: Behavioral intention to use

1) Perceived ease of use (PEOU) has a positive effect on perceived usefulness (PU) of an LCS: It can be observed that there is a significant positive relationship between two variables. Therefore, H1 is supported.

2) Perceived ease of use (PEOU) has a positive effect on attitudes towards using (ATU) an LCS: It can be observed that there is a significant positive relationship between two variables. Therefore, H2 is supported.

3) Perceived usefulness (PU) has a positive effect on attitudes towards using (ATU) an LCS: It can be observed that there is a significant positive relationship between two variables. Therefore, H3 is supported.
4) Perceived usefulness (PU) has a positive effect on behavioral intention to use (BIU) an LCS: It can be observed that there is a significant positive relationship between two variables. Therefore, H4 is supported.
5) Attitude towards using (ATU) has a positive effect on behavioral intention to use (BIU) an LCS: It can be observed that there is a positive relationship between two variables. Therefore, H5 is supported.
6) Perceived ease of use (PEOU) has a positive effect on behavioral intention to use (BIU) an LCS: It can be observed that there is a positive relationship between two variables. However, the relationship does not seem to be significant, and the correlation is not strong. Statistically, H6 is supported.
7) Lack of LCS availability has a negative effect on perceived ease of use (PEOU) of an LCS: A positive relationship between two variables can be observed. This result indicates that participants perceived that lack of LCS availability does not affect ease of use. Therefore, H7 is not supported.

VII. DISCUSSION

This study modified TAM to validate the relationship between the TAM core constructs as well as the effects of moderators proposed with current study. Overall, the statistical analysis shows that the findings of the current study are consistent with the original TAM findings [32]. All TAM related hypotheses within this study were proven to have positive correlations that are statistically significant. Further, this study indicates that when users' perceived ease of use increases, the perceived usefulness increases accordingly, they also developed a positive attitude towards utilizing it. Similarly, the perceived usefulness increased the degree of positivity toward usage, which subsequently affected the behavioral intention to use. In addition, users involved in this study showed a positive attitude towards LCS, and they intend to use an LCS in their work.

CONCLUSION

In summary, this study modified the original TAM to measure lecturers' behavioral intention to use the LCS. It validates the relationship between perceived ease of use, perceived usefulness, attitude towards usage, and overall impact on behavioral intention to use. This study successfully confirmed TAM can be employed to predict the acceptance of LCS prior to the actual implementation. Moreover, perceived ease of use and perceived usefulness were shown to be important to users' perceptions of an LCS. In order to promote and encourage end user acceptance of a new education technology, it is necessary to consider not only the ease of use, but also the usefulness. Further, the findings show that lack of LCS availability does not mean lecturers believe using LCS is difficult. Most significantly, the findings of this study could be used to convince senior management supporting continued use of lecture capture technologies in teaching and learning. In future work, it is worth to study about how users' beliefs and attitudes change over time after they experienced the system.

LIMITATION

Although the research has reached its aims, there were some limitations. First and most importantly, the sample taken for the study was small. Most lecturers did not respond to the questionnaire because of their busy work schedule and it is difficult to encourage them to participate in surveys. The response rate of this study is only 2.6% and it can introduce bias into survey results. A low response rate need not affect the validity of the data collected, but it is still necessary to test for non-response effects and make corrections to the original data in order to maximize validity [33]. Additionally, basic demographic characteristics, such as gender, age and teaching experience of respondents have not been collected because respondents may perceive these questions as an invasion of privacy. Further analysis of the survey data cannot be achieved because lack of demographic information.

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