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# DEVELOPING LEARNING SYSTEM CONTINUANCE WITH TEACHERS AND STUDENTS: CASE STUDY OF THE ECHO360 LECTURE CAPTURING SYSTEM

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## Abstract

*Research on learning system continuance has been focused mostly on students' conscious behaviour. While the institutional decision to adopt and sustain the deployment of a new technology provides strong support for organisational adoption, the key factor for achieving long-term continuance relies on individual behaviour from different stakeholders, e.g., students, support staff and teachers. Existing literature on Information Systems (IS) continuance, however, suffers from weaknesses. On the one hand, perceptions from other stakeholders, such as teachers and support staff, are often neglected in the literature. On the other hand, there is a theoretical gap in explaining continuance behaviour through traditional models because unconscious automatic behaviour (e.g., IS habit) plays a more critical role in influencing continuance behaviour than previously expected. This study takes a qualitative approach to identify perceptions from students and teachers on which features and usage patterns of a lecture capturing system (Echo360) would develop long-term continuance behaviour through both conscious and unconscious behaviours. Our results suggest that long-term continuance can be achieved by a combination of Information Technology (IT) artefact extension (e.g., providing better search functionality and multimedia tagging) and developed IS habits through curriculum design.*

*Keywords: Information System Continuance, Learning System, Lecture Capturing System, Post-adoption Behaviour, Habit, Unconscious Automatic Behaviour.*

# 1 INTRODUCTION

One of the recent advancements in Information Systems (IS) research has been on investigating the role of unconscious automatic behaviour in influencing users' post-adoption behaviour. Ortiz de Guinea and Markus (2009) postulate that Information Technology (IT) continuance behaviour "may be far less intentional and far more automatic than the IS literature would lead one to presume." A classic example to support this postulation is the preference by system administrators of difficult-to-use command line interfaces over easy-to-use graphical interfaces (Velasquez and Weisband 2008), which contradicts to the prediction by traditional behavioural models, e.g., Technology Acceptance Model (TAM) (Davis 1989).

A challenge for IS designers and educators is to maintain learning system continuance behaviour of different stakeholders. While digital natives (Bennett et al. 2008) easily accept new learning technology as a part of life, it is difficult to achieve long-term continuance because evolutionary change in learning technology cannot catch up with the "revolutionary needs" of these digital natives. A possible way to develop long-term learning system continuance behaviour is to build up unconscious automatic habits among digital natives. However, the inadequacy in qualitative learning system continuance research, particularly the lack of qualitative data from stakeholders other than students, makes it difficult for IS designers and educators to build a learning system with such features.

Taking a qualitative research approach on the case study of a newly implemented lecture capturing system, Echo360, we identify perceptions from students and teachers on which features and usage patterns would develop long-term continuance behaviour through both conscious and unconscious behaviour. Specifically, we take a case study approach to address the following research questions: (1) Which features and usage patterns of Echo360 would develop long-term continuance behaviour through both conscious and unconscious behaviours? (2) How can Echo360 align with curriculum design to achieve long-term continuance?

This paper explores the acquisition and trial of Echo360 with a select group of research students on a mandatory teacher development course as a precursor to an institution-wide launch at a university in Hong Kong. The approach taken is an exploratory analysis of a web discussion forum with respect to Echo360 adoption, and a series of semi-structured interviews to ascertain impact and implications. Lessons learned are presented, as well as directions for future research.

## 2 LITERATURE REVIEW

This section first provides an overview of the literature on lecture capturing research and the potential areas for future research. Next, we present the IS literature on rational and emotional behaviour in technology acceptance and post-adoption research. Finally, this section ends with a review of the literature on the effects of unconscious behaviour in IS continuance.

### 2.1 Review on Lecture Capturing System Research

The lecture capturing system itself is not a new innovation. Cases in lecture capturing technology adoption can be dated back to the mid 1990s, when Abowd (1999) conducted an action research on implementing a classroom capturing system "Classroom 2000" to provide a "living educational environment" for students. Yoshida et al. (2005) later report another case in the lecture capturing system research. The theme of this research is to develop automatic keyword recognition, tagging and online publication through speech analysis. Both researches are generally on the technical side, following the design science approach (Hevner et al. 2004).

While these studies are focused on the technical side and technical support, it is the studies of the behaviour of students and teachers, both as conscious behaviour and unconscious behaviour, that have

not been reported in the literature. There is an emerging need to provide a set of best practices by studying different stakeholders' perceptions and expectations of the lecture capturing system, particularly issues on its usefulness and continuance (retention) with respect to different stakeholders.

## **2.2 Conscious Intentions of IT Use**

Research on users' behaviour in IS use has been focused on the conscious intentions made by rational or emotional needs (Ortiz de Guinea and Markus 2009). Such decision process may be rational (e.g., users' beliefs, expectations and past experiences) or emotional (e.g., attitude and satisfaction). These constructs are well explained in the classical behavioural models. The first example is TAM (Davis 1989), which predicts a conscious decision on IS usage through factors influencing a rational decision process. The second example is the Theory of Planned Behaviour (TPB) (Ajzen 1991), which was later extended to predict IS usage behaviour (Mathieson 1991). TPB predicts intention and actual behaviour by three emotional factors: attitude, subjective norm and perceived behavioural control.

Addressing the inadequacy in TAM-based theories on IS continuance research, Expectation Confirmation Theory (ECT) (Bhattacharjee 2001) attempts to solve this theoretical gap because IS continuance is not a simple extension of adoption behaviour (Limayem et al. 2007). Bhattacharjee (2001) separates the traditional single model consisting of pre- and post-adoption factors into a pure post-adoption model (Sorebo and Eikebrokk 2008), adding a number of emotional factors, such as confirmation and satisfaction, to predict continuance intention. This post-adoption model has been applied to educational technology research (e.g., Chiu and Wang (2008) and Hong et al. (2008)). The findings in IS are also verified and supported in the educational context. However, literature in educational technology continuance is mostly quantitative. Identifying factors that positively influence continuation intention qualitatively provides useful practical advice, or best practices, to system designers to improve continuance behaviour.

## **2.3 Unconscious Intentions of IT Use**

Ortiz de Guinea and Markus (2009) explain that the unconscious intentions of IT use as "well-learned action sequences may be activated by environmental cues and then repeated without conscious intention." Limayem et al. (2007) define the term IS habit to describe this unconscious intention of IT use as "the extent to which people tend to use IS automatically because of learning." Different literature posits that IS habit has a more significant effect in influencing long-term continuance behaviour than previously expected. Limayem et al. (2007) suggest that IS habit moderates the link between intention and continuous usage. Venkatesh et al. (2008) report that as time passes, the power of habit in influencing system use is greater than either behavioural intention or behavioural expectation. Kim (2009) postulates that habit is "believed to play important roles" in technology use.

Research on unconscious IS usage is just at the very beginning stage, especially on answering how IS habit can be developed to increase continuance behaviour. Limayem and Cheung (2008) advocate that teachers should develop students' habit of using learning systems so that usage becomes automatic and continued in the long term. However, literature on IS habit research has a dearth of qualitative studies. For example, Kim and Han (2009) report a quantitative analysis of an extended model of ECT, with IS habit as an additional construct. Limayem and Cheung's (2008) work is similarly quantitatively based. Mark and Vogel (2009) also take a quantitative approach on investigating the relationship between learning system personalization and IS continuance intention, concluding that adding personalized applications in a learning system develops users' IS habit.

In summary, the issues of which features in a lecture capturing system trigger IS habit formation, and how they influence continuance intention, have not been thoroughly studied in a qualitative fashion. This study purports to fill this gap. The research approach is explained in the next section.

### **3 RESEARCH APPROACH**

Our approach explains the What, How, and Why in the context of learning technologies continuance from both student and teacher perceptions. A two-stage qualitative approach was used to answer our two research questions regarding: (1) identifying features and usage patterns of Echo360 to develop long-term continuance behaviour through both conscious and unconscious behaviours, and (2) how Echo360 could align with curriculum design to achieve long-term continuance.

The first stage of our qualitative approach was conducted by analyzing the content presented by the course attendees on their perceptions of the Echo360 features, the usefulness, and continuance intention in the online discussion forum. This forum was set up as an extended online teaching and learning activity outside the classroom. The course attendees could voluntarily participate and express their views. To motivate online participation, attendees who participated in this online discussion were awarded with 1 point for online participation (maximum 5% of the course grade) as recognition of their contribution.

The second stage comprised a series of semi-structured interviews to consolidate the views from selected attendees. Based on the literature of ECT (Bhattacharjee 2001) and IS habit (Limayem et al. 2007; Ortiz de Guinea and Markus 2009), we developed a case study protocol addressing issues of how conscious behaviour (e.g., perceived usefulness) and unconscious behaviour (e.g., IS habit) affect IS continuance intention. The semi-structured interviews took place from January to February 2010. A delay in the semi-structured interviews was necessary in our study because the course assessment results were released in early January. It is an ethical concern that the interviewees should always participate voluntarily in the interview without any fear of affecting the assessment results due to their participation (or non-participation) and/or response to the questions. The procedures for conducting the interviews were performed as suggested by Rubin and Rubin (1995) and Shroff et al. (2007), and applied in similar research (Shroff et al. 2007).

We felt that the two-stage qualitative approach was more suitable for this study for a number of reasons. Case study is particularly suitable if the research area is new, such that the researchers have less priori knowledge on the measurement of variables (Benbasat and Goldstein, 1987), and the researchers attempt to explain how a phenomena happens (Yin 1994). The first stage of exploratory analysis addresses the relevance of constructs and items in our research context. The standard items used in the constructs of TAM and ECT do not truly reflect the context of educational technologies. We can make use of the results from the first stage to develop the measurement of variables in the second stage of semi-structured interviews.

### **4 CASE BACKGROUND**

From September 2009 until February 2010 we have conducted a number of research activities for this project. We evaluated the user perceptions on Echo360 as adopted in a compulsory course "Teaching Students: First Steps." This is a compulsory course for all postgraduate research students, mostly in-service teaching assistants, to equip themselves to become successful teachers. The instructors make use of Echo360 heavily in teaching and learning activities, as well as for assessment tasks. These characteristics align with our research questions in two ways: (1) from the views of both students and teachers, evaluating the features and usage patterns of Echo360 that would develop long-term continuance behaviour through both conscious and unconscious behaviours; and (2) aligning Echo360 with curriculum design (e.g., assessment tasks, teaching and learning activities) from both student and teacher inputs to achieve long-term continuance.

### **5 RESULTS**

In the first stage of the study, a total of 55 out of 120 course attendees participated in the online discussion. This online discussion involves open questions, such as "Why do you think these features

are useful?"; "Do you think Echo360 will still attract students and teachers after a long run (e.g., 1 year)?; Why do you think so?"; "How will you further boost up the usage of Echo360?" and "What suggestions do you have to improve Echo360?" The comments presented by the course attendees are classified as "usefulness," "continuance" and "habit" (Limayem et al. 2007). Tables 1, 2 and 3 show the results of the content analysis of the first stage.

<b>Usefulness</b>	
<b>Item</b>	<b>Description (Frequency of appearance)</b>
Unavailability on attending lecture	Absence: sickness/ unexpected (8), Auditing (2), Course schedule conflict (7), Course selection: missing first class (2), Watching the same course at different semesters/ by different instructors (1), No specific comments (1)
Revision	Segment of a class (8), Whole class (3) Difficult concepts (10), Repeated experience of teaching and learning activities (1), Language Barrier (1), Repeated access after years when gaining relevant working experience (3), Part of class missed (10), Slides with verbal annotation (4), Disabled students (1), No specific comments (11)
Improve teaching quality	Formative assessment on students' class performance (1), Reduced workload for addressing repeated questions (6), Evaluation of teaching quality by watching students' behaviour in class (2), Peer learning from colleagues by mutual sharing of class capture (7), Well preparation (3), Evidence of complaints (1), Evaluation of student performance (1), No specific comments (1)
Extended Lecture	Time limit: interesting but less important topics can be made online for viewing after class hours (1), No specific comments (1)
Archive and Publish	Reputable speakers' seminars and classes captured and archived for viewing by students and even the public (2)

Table 1. Factors influencing usefulness as identified by the course attendees in Stage 1

<b>Continuance</b>	
<b>Item</b>	<b>Description (Frequency of appearance)</b>
Course Content	Boring and Useless lectures - negative in enhancing continuance behaviour(1), Good content and presentation (2), Extended use of lecture content e.g., assessment (1)
Teaching Quality	No specific comments (1)
Monitor and Censorship	Abuse of lecture capture – published publicly without consent - negative in enhancing continuance behaviour (1), No specific comments - negative in enhancing continuance behaviour (3)
Student Perceptions	Absence due to availability of lecture capture - negative in enhancing continuance behaviour(2), Backup as compliment than replacement(1)
Assessment	Formative assessment: easier work by teacher (1)
Personalized Learning	Student learning in different styles, time and place (2)
Ease to Administer	Availability: fast (3), reliability (3), No specific comments (3)
Quality of Video	No specific comments (1)
Student Motivation	No specific comments (1)
Policy	No specific comments (1)

Table 2. Factors influencing continuance as identified by the course attendees in Stage 1

<b>Habit</b>	
<b>Item</b>	<b>Description (Frequency of appearance)</b>
Personalized Applications	Instant Messaging (4), Bookmark (1), Note taking (1), No specific comments (3)
Delay time	Content available as soon as possible after the lecture (1)
Automation	Automatic operation: transparent to teachers (2)
Dependency	No specific comments (1)
Set default on	No specific comments (1)

Table 3. Factors influencing IS habit formation as identified by the course attendees in Stage 1

In the second stage of the study, we randomly selected 6 participants in the first stage for semi-structured interviews as described in Research Approach. We examined the issue from the three

primary constructs previously discussed in Tables 1, 2 and 3. The results are summarized in subsections 5.1, 5.2 and 5.3.

### 5.1 Usefulness

**Prior use** - It is worth noting that lecture capture technology was being used by many students and teachers individually before the institutionalization of Echo360. For example, MP3 recorders were used frequently by students in lectures; digital video recorders were used by teachers for recording departmental guest seminars for internal use.

**Student Perception** - Instead of developing an intention to skip classes, the participants believe that Echo360 plays greater value in helping students to revise. Video recording is *“nothing new but it gives us a chance to do the rethink for the lecture... I can find something new that I could not find in the classroom by watching the video,”* commented one participant. Moreover, re-visiting a lecture after acquiring additional experience (e.g., after one year of internship) giving students more insights. Some participants also point out that Echo360 is extremely useful for a student to learn presentation skills from outstanding lecturers.

**Teacher Perception** – The participants comment that Echo360 is useful especially for young teachers to improve teaching quality. *“It is difficult to monitor my gesture and language I used during teaching. Even with some comments but they may be subjective. With the lecture capture video I can receive objective feedbacks.”* Echo360 also allows teachers to evaluate the performance of students in lectures, allowing them to respond to the needs of students. Finally, the participants voice that Echo360 effectively reduces their workload because students no longer repeatedly ask surface-level questions that are covered in lectures. *“I will ask the student to watch the recording before they come to ask me for the same question. This saves a lot of time.”*

### 5.2 Continuance

**Student Perception** – Generally, participants comment that Echo360 is welcome by students, and they give positive feedback for long term continued use. They feel it serves as a backup for students in case of sudden absence due to sickness, and serves as an archive for revision before assessment (e.g., assignment and examination). However, some participants indicate negative effects on continuance that should be avoided. For example, students may be too shy to speak up in class because they are afraid of making mistakes. Thus, it is a concern whether the classroom interaction would be reduced when Echo360 is used, especially during discussions.

**Teacher Perception** – The main concern of our teaching participants is automation and a sense of censorship as affecting long term continued use. It is critical to have the process transparent to teachers, and for it to be well-supported by technical staff. Ideally, the whole process should involve minimal effort from teachers. *“If my set-up cost is 0 (transparent), I will surely ask my student to watch the video before coming for consultation.”* On the other hand, the participants are worried about censorship by the institution and by the students. *“Some teachers may screen their speech before they speak”,* as commented by one participant. *“Every one will speak in a very cautious manner... Some concepts are easier to be explained in Cantonese, but if there is a system for monitoring (English as the official medium for instruction), I will keep using English and my students can only see me after the lecture. This may raise some problems (on learning effectiveness).”*

### 5.3 Habit

**Student Perception** – Personalized learning styles are critical in habitual development as explained by one participant. *“I cannot concentrate on taking notes while listening. I will miss one of them. That’s why I have the habit to watch the lecture capture video.”* The functionalities of Echo360 can be extended to foster habitual development by improving the multimedia tagging features, personal annotation and note taking functions. Most importantly, the course content, but not the technology

itself, is the key driver for habitual development. “When I find a lecture useful and interesting, we share among friends (and build up a habit of sharing).”

**Teacher Perception** – The participants suggest that habit is driven by tasks. “Sometimes if you leave a challenging question and then the teacher gives some hints... Or after the exam, the teacher may explain about the questions.” “I give short quizzes for students to see if they revised or not.” At the same time, teachers should also develop good habits while using Echo360 for capture. “Use the microphone all the times, and do not walk beyond the camera’s view or block the whiteboard,” as suggested by one participant.

## 6 DISCUSSION

In this research, we have identified the useful features of Echo360 and explained how such features trigger IS habit formation, and how they influence continuance intention. The lecture capturing system is undoubtedly perceived as being useful by students and teachers. The benefits students gain through Echo360 is an archive and backup of lecture videos that are available for revision; teachers find it beneficial in improving teaching quality and providing feedback to students. However, the continuance intention is not driven solely by providing useful functionalities. For example, some students and teachers do not feel comfortable when they are being recorded in lectures. The sense of surveillance creates negative impacts on continuance intention. Prior negative experience on abuse of lecture captures (e.g., when students publish a lecture capture to YouTube without consent) also builds up resistance on continuous usage of lecture capturing systems. Habitual behaviour is developed by the tasks themselves but not the technology. Teachers may utilize Echo360 to address FAQs and assessment issues which may eventually develop dependency and hence habitual behaviour of usage.

Some directions for future research can be on demographic backgrounds, for example (1) discipline and (2) language background. Future work could be carried out on identification of the differences between students and teachers from different disciplines (e.g., Business Vs Engineering), and a comparison of the needs of students from different language backgrounds (e.g., international students vs local students). Generalization of habitual behaviour formation in other IS by extending the research will be another dimension of future studies.

## 7 CONCLUSIONS

As Ortiz de Guinea and Markus (2009) posit, habitual behaviour is developed by the task itself, not by the tool. Echo360 is considered to be useful by students in revision, and by teachers for reducing workload and improving teaching quality. Having these tasks aligned with Echo360 functionalities, we can develop habitual behaviour by taking different personalized learning styles into account, for example, by providing different personalized features, such as multimedia tagging and better search functionalities. We can also form strategies for promoting long-term continued use of Echo360; this can be done by aligning it with the curriculum, for example, highlighting the important points for revision or assessment in the lecture videos with proper tagging. At the same time, the fear of teachers and students regarding censorship should be addressed properly to minimize the negative effect on learning effectiveness.

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