

Exploratory Study of Effects of Learning System Acceptance on Learning Program Outcomes

Fusing the Technology Acceptance and Technology Mediated Learning Models

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Abstract: End-user learning is an important element of Information Systems (IS) projects inside organizations. End-user learning can constitute roughly 5% to 50% of project budgets. To lower costs and make learning more convenient for the end-users, organizations are largely utilizing online systems for the electronic delivery of such learning programs, referred to as Technology Mediated Learning. In this scenario, before the end-users are able to immerse themselves in the actual learning program, they are first required to adopt and use an online learning system. Currently published IS research has two mature streams of publications: one stream focused on models of technology acceptance and usage that has led to the UTAUT (Unified Theory of Acceptance and Use of Technology) model and a second stream focused on the TML (Technology Mediated Learning) framework of learning structures and outcomes. This research study aims to build and validate an empirical model to study of effects of learning system features, content and structure from the TML framework on acceptance and adoption constructs from the UTAUT model and measure how they impact learning outcomes. By surveying users of an online learning system and their usage behaviour of specific learning system capabilities, this study measures the acceptance and usage of the system and the learning outcomes of mastering MS-Office productivity software. The results of this study have implications for both the UTAUT and TML research streams and also the design and use of technology mediated learning by practitioners.

1 INTRODUCTION

End-User learning is one of the most pervasive methods for developing human resources within modern organizations to effectively deploy and use Information and Communications Technology (ICT) in their business operations. Majority of learning deals with teaching end-users how to use computer applications and gain skills to do their assigned jobs in the organization. There are three targeted goals of most end-user learning programs (Gupta, et al., 2010): (1) skill-based goals (tool procedural) that target the user's ability to use the system, (2) cognitive goals (tool conceptual or business procedural) that focus on the use of the system to solve business problems and (3) meta-cognitive goals that focus on building the individual's belief regarding their own abilities with the system. To lower costs and make learning more convenient and schedule friendly for employees, modern organizations are currently utilizing online systems

for the electronic delivery of end-user learning (ASTD, 2011). Recent reports suggest that upwards of 40-50% of end-user learning is conducted through technology mediated learning (TML) systems (ASTD, 2011). A comprehensive TML research framework is elaborated in Gupta and Bostrom (2009). In the TML framework, the learning structures (or scaffolds) support the delivery of the learning content, such as the rules, resources and methods, the level of detail in the instructions given to participants, the guidance provided by the facilitator and the nature of the facilities and equipment used in the learning session.

Most commercial TML systems typically are feature rich applications that support various learning tasks and learning scenarios. The set of features allow end users to search learning content, build a customized learning program by planning a sequence of courses, manage their learning progress and even receive a certificate on completion. With

the popularity of TML applications and an increase in cloud based technologies, there is vast diversity in these online learning systems, which employ various platforms and software architectures that pose a variety of challenges (Bensch and Rager, 2012). IS researchers have long called for additional research into the questions of how such technology enhances the learning processes and outcomes (Alavi and Leidner, 2001). Published research has found that the learner's acceptance of e-Learning technologies and specific application features have been found to be important factors that strive to address some of these questions (Lee, Yoon, Lee, 2009; McGill and Klobas, 2009; Piccoli, Ahmed and Ives, 2001).

The UTAUT framework models the factors that govern the acceptance, behavioural expectations and the ultimate usage behaviour of a technological (Venkatesh, Thong and Xu, 2007). It has evolved over 20 years from TAM (Technology Acceptance Model Theory -Davis, 1989) as a vehicle for evaluating factors that impact an individual's acceptance and use of technology. The TAM model conceptualized the relationship between perceived ease of use (the level of difficulty of adopting a technology) and the perceived usefulness of the technology (the user's performance expectations) on the user's intentions to use the technology. Several research studies have applied the Technology Acceptance and Use Model to understand effects of the pedagogical design of such e-learning systems. The focus has been on the impact of learning system features such as learning activities, security, information and service quality, interactivity and responsiveness, learner control and the ability to self-organize their learning on the user's acceptance of those systems (Selim, 2003; Pituch and Lee, 2006; Roca and Gagne, 2008; Sun, et.al., 2008).

Recent TML based research studies about the effectiveness of online learning systems on end user learning task conformance and learning outcomes has been ambivalent (Gupta and Bostrom, 2009). Some have reported positive impacts, while others have not. Such results support the need to merge additional constructs into the TML framework to represent the user's technology acceptance and usage behaviour.

1.1 Research Goals

The focus of this research study is to answer the question "Does the level of acceptance and use of features and capabilities of an online learning system impact learning outcomes?" To answer this

question, the paper extends the TML framework with constructs from the UTAUT model and their impacts on learning appropriation and outcomes. The goals of this study are:

- To develop and empirically validate an extended TML research model that also includes the users' learning system usage behaviour and the facilitating conditions supporting such usage.
- To measure the impacts of the usage behaviour and facilitating conditions on the users' learning outcomes.

2 BACKGROUND THEORY

Information technology deployed in typical learning programs is used as a primary structural element in the learning process (e.g. Simulations or exercises that are part of the learning process) or as a secondary tool in the learning process (e.g. Computer based tests and quizzes) The latter approach implies the technology is part of the learning delivery process. However, the actual use of the features and capabilities of an online learning system have been found to differ across groups of users (Bekkering and Hutchison, 2009). Individual differences play a role in what features of these systems are used and how the systems can impact each end-users' learning process and outcome (Gupta, Bostrom and Anson, 2010). The current research stream of IS end-user learning has studied the impact of the above learning structures on different learning outcomes along with various confounding factors such as the individual's learning style, their motivation to participate and their interest in the learning content (Bostrom, et.al., 1990; Nogura and Watson, 2004). While the TML model incorporates technology as a structural element of learning delivery, it does not take into account the usage behaviour of the specific capabilities of the learning platform by the individual users. Individual differences can impact learning outcomes by generating a different mental response to the learning content and influencing their interactions with the learning delivery structures. Learning style of the user plays an important role in the user's conformance to the learning tasks embedded in the online learning system (Bohlen and Ferratt, 1997).

Abstract learners perform better than users with concrete learning styles in online technology based learning. The trainee's motivation and attitudes also

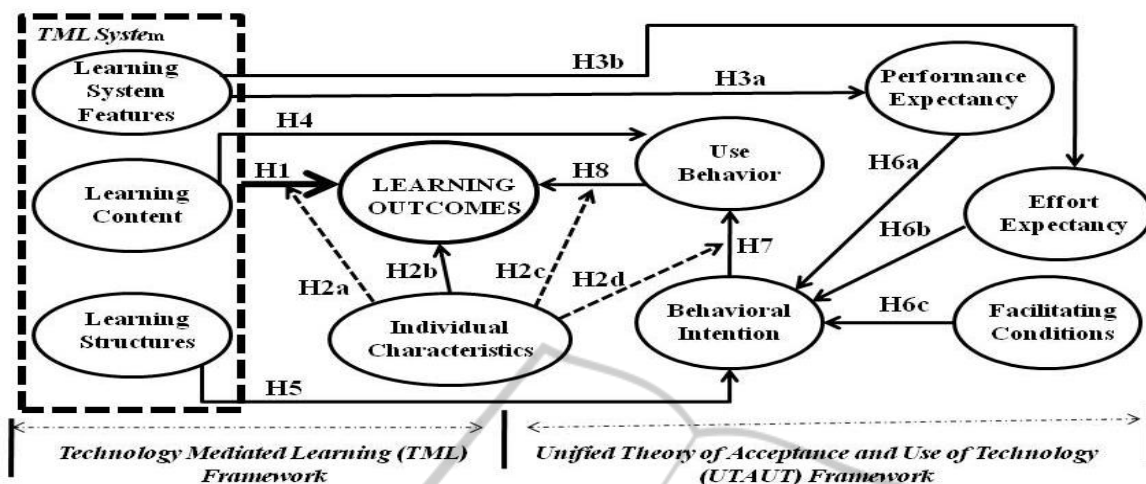


Figure 1: Research Model.

have been found to influence learning performance in the TML context (Szajna, B. and Mackay, J.M., 1995; Yi and Davis, 2003). Both intrinsic motivation and extrinsic motivation played a role in the adoption and appropriation of the learning system capabilities and the completion of the online learning regimen (Gupta, Bostrom and Anson, 2010). Intrinsic motivation has been found to influence the personal innovativeness of the learner that directly impacts how they deal with obstacles faced with the learning system.

The technology acceptance model (TAM) is one of the most widely used models used in Information systems research to study the adoption and usage intentions of individual users towards information systems (Ajzen, 1988; Ajzen, 1991). TAM was developed by Davis (1989) to explain the determinants of the intention to use computer systems. The UTAUT model extended that TAM framework to include facilitating conditions and individual differences that can influence the user's intentions to use a technology (Venkatesh, Thong and Xu, 2012). The UTAUT model also has factors that are related to the working environment in the organization, such as social influence and facilitating conditions. The UTAUT model includes age, gender and experience with technology as important individual differences that moderate intention to use and actual usage behaviour.

3 RESEARCH MODEL

The research model is displayed in Figure 1. The

research constructs are defined in the following subsections. The dependent variable in the model is Learning Outcomes (LO).

The independent variables are the three components of the TML system (modelled as a formative second order construct) – (i) Learning system features (LSF), (ii) Learning Content (LC) and (iii) Learning Structures (LS). The Individual characteristics (IC) and Facilitating Conditions (FC) are also independent variables in the model.

3.1 Learning Outcomes

Learning outcomes (LO) focus on the mental awareness and judgements of the end-user and the levels of application of acquired knowledge towards operating business functions (Gupta, et al., 2010). The learning outcomes is a formative construct that consists of three types of outcomes – skill based, cognitive and meta-cognitive.

3.2 Learning Content and Learning Structures

Learning content (LC) refers to instructional methods that encourage students to accomplish learning goals. These allow end-users to fill gaps in their understanding and builds skills (skill focus) and knowledge about how they can use the system to improve their productivity (cognitive focus). “Soft skills” are also developed that allow members to learn collective beliefs and norms that help them develop confidence and knowledge in solving future business problems.

Learning structures (LS) refer to the scaffolds that support the delivery of the learning content. Also referred to as appropriation support (Gupta, et.al, 2010), they include the rules, resources and methods that support the elements of the collaborative learning session. For this research study, the learning structures include level of detail in the instructions given to participants, the guidance provided by the facilitator and the nature of the facilities and equipment used in the learning session.

3.3 Learning System Features (LSF)

As the use of TML in learning programs intensifies, the need to list the features of such applications as a component of the overall learning system is more important. Capabilities mentioned in the research stream refer to responsiveness and quality (Lee, Yoon & Lee, 2009), feedback and facilitation of communications about assigned instructional work (Putuch & Lee, 2006), flexibility, autonomy and user control of the learning process and steps (Piccoli, Ahmad and Ives, 2001).

3.4 Individual Characteristics (IC)

People prefer learning methods based on their specific learning styles (Nogura and Watson, 2004). Individual differences influence the formation of mental models, which effects the learning process. “States” are general influences on performance that vary over time and include temporal factors such as motivation level and interest level (Bostrom, et.al., 1990). “Traits” are static aspects of information processing affecting a broad range of outcomes. Cognitive traits refer to learning styles such as a preference for procedural or abstract knowledge and an exploratory or reflective approach to instructional content delivery format (Bostrom, et.al., 1990; Nogura and Watson, 2004). For this research study, the Individual characteristics (IC) variable is measured using motivation and interest as states and individual learning style as traits. Both intrinsic motivation and extrinsic motivation influences the learner’s state and is measured in the survey.

3.5 Performance Expectancy and Effort Expectancy

Two key components were used in the original TAM model – perceived usefulness and the perceived ease of use of any technology innovation. The UTAUT model includes two components – Performance Expectancy and Effort Expectancy (Venkatesh,

Thong and Xu, 2012). Performance Expectancy (PE) is referred to as the “degree to which a person believes that using a particular system will enhance their performance” (in a job or activity). Effort Expectancy (EE) defines the “degree to which a person believes that using a particular system would be free of effort”. It is posited that intention to use and actual usage of a system will positively depend on both constructs (Venkatesh, et. al., 2003).

3.6 Facilitating Conditions (FC)

Facilitating conditions are environmental factors that refer to the users’ perceptions of resources and support to use the technology (Venkatesh, et. al., 2008). In the context of a learning system, facilitating conditions include resources, accessibility, compatibility with other systems, infrastructure quality and support (McGill and Klobas, 2009; Venkatesh, et.al., 2008).

3.7 Behavioural Intentions and Usage Behaviour

Behavioural intentions (BI) and actual usage behaviour (UB) to use the technology are part of the original TAM and the UTAUT models (Venkatesh, et. al., 2003). Behavioural intentions imply the plans and intentions to use the system. Such intentions can be habit forming and also be constituted from the users’ past experiences. Actual usage behaviour refers to the duration, frequency and intensity of the use of the system (Venkatesh, et.al., 2008).

3.8 Research Hypotheses

The research hypotheses are listed below. Given the exploratory nature of this study, the emphasis is to model and test various possible relationships across constructs in the TML and UTAUT models.

- H1: The TML System has a positive effect on Learning Outcomes.**
- H2a: Individual Characteristics will moderate the relationship between the TML System and Learning Outcomes.**
- H2b: Individual Characteristics will have a positive effect on Learning Outcomes.**
- H2c: Individual Characteristics will moderate the relationship between Use Behaviour and Learning Outcomes.**
- H2d: Individual Characteristics will moderate the relationship between Behavioural**

Intention and Use Behaviour.

- H3a: The Learning System Features will have a positive effect on Performance Expectancy.**
- H3b: The Learning System Features will have a positive effect on Effort Expectancy.**
- H4: The Learning Content will have a positive effect on Use Behaviour.**
- H5: The Learning Structures will have a positive effect on Behavioural Intention.**
- H6a: Performance Expectancy will have a positive effect on Behavioural Intention.**
- H6b: Effort Expectancy will have a positive effect on Behavioural Intention.**
- H6c: Facilitating Conditions will have a positive effect on Behavioural Intention.**
- H7: Behavioural Intention will have a positive effect on Use Behaviour.**
- H8: Use Behaviour will have a positive effect on Learning Outcomes.**

4 METHODOLOGY

4.1 Data Collection

Our data collection approach will consist of surveying a collection of approximately 400 business school students, who use an online learning system, “MyITLab”, to learn spreadsheet and database software applications. The survey consists of 3 questions for each construct and uses a 5 point Likert scale (1 being strongly disagree and 5 being strongly agree) to measure user responses to each item. The survey is included in the appendix.

A pilot study has been completed with 45 users and reliability and validity of the survey instruments has been calculated (Table 2).

4.2 “Myitlab” Learning System

MyITLab (www.myitlab.com) is a feature rich learning application that allows users to complete a variety of simulated tutorial exercises and case studies with Microsoft excel and access software packages. While some parts of the system can be cumbersome and requires extensive scaffolding, such as initial registration, login and a properly configured browser for accessibility, yet the major benefits of using the system are quick feedback on assignments, interactive help on various procedural aspects of Excel and Access software and organization of the learning process.

5 PRELIMINARY RESULTS

The 45 surveys collected from the pilot study were analyzed with SPSS version 20 (factor analysis, Scree plot and Cronbach’s alpha) and results are presented in Tables 1 and 2. Factor analysis with Varimax rotation found 6 factors with eigenvalues greater than 0.9 with an explained variance of 78.4%. Four constructs – Learning Outcomes (LO), Learning System Features (LSF), Usage Behaviour (UB) and Individual Characteristics (IC) are formative and do not show as factors. The results also indicate adequate reliability and (Cronbach’s Alphas are above .67 for all constructs) and discriminant validity to proceed with the full data collection during Feb-March 2013. The full survey will be completed and results and hypotheses test outcomes will be presented at the conference.

Table 1: Demographic Variables (n = 45).

Variable	Min	Max	Mean	S.D.
Years of Edu (yr)	2	6	2.96	0.92
Prior Excel Use (yr)	0	8	2.36	1.95
Prior Access Use (yr)	0	6	0.93	1.25
Weekly Usage in Hrs	1	15	3.57	2.66
Gender	Male: 28		Female: 17	

Table 2: Factor Analysis and Construct Reliability (CR).

	PE	LS	FC	BI	EE	LC
Cronbach’s Alpha	.89	.74	.72	.79	.85	.67
Item 1	.81	.32	.74	.66	.37	.66
Item 2	.73	.82	.82	.81	.71	.32
Item 3	.77	.22	.21	.58	.63	.22

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APPENDIX

The Survey Instrument is below:

Excel Usage Experience (in years) _____ Years of Education _____
 Access Usage Experience (in years) _____ Gender: M F
 How many hours/week on average, did you use MyITLab? _____
 LO1-I understand how I can navigate Excel and Access
 LO2-I am confident I can finish an assigned task with office
 LO3-I can use features of Excel and Access to solve problems
 UB1-I used all of the available features of MyITLab.
 UB2-I used MyITLab a lot compared to other learning system
 FC1-I had the resources necessary to use MyITLab
 FC2-I had the knowledge necessary to use MyITLab.
 FC3-I had all the support necessary to use MyITLab
 BI1-I had a favourable attitude towards using MyITLab.
 BI2-I never disliked using MyITLab
 BI3-I am satisfied with the guidance provided by my instructor in the learning process.
 LC1-I would use MyITLab to learn another application.
 LC2-The learning materials provided me with enough details.
 LC3-I am satisfied with the documentation of MyITLab
 EE1-It was very easy for me to learn to use MyITLab.
 EE2-It was easy to find information about MyITLab
 EE3-I found MyITLab to be very easy to use.
 LSF1-The output from MYITLab was presented in a useful format.
 LSF2-The information from MyITLab is accurate.
 LSF3-MyITLab allowed me to take control of my learning process
 PE1-Using MyITLab enhanced my effectiveness in learning.
 PE2-Using MyITLab increased my productivity in the course
 PE3-I found MyITLab to be very useful
 LS1-I am satisfied with the facilities and equipment that were available for my use in the learning process.
 LS2-MyITLab system fits well with the way I like to learn
 LS3-I understood the policies around using MyITLab.
 IC1-I was motivated to learn as much as I can from this class.
 IC2-I was very interested to take this class.
 IC3-I was excited about learning the skills that were covered