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Factors affecting acceptance & use of ReWIND: Validating the extended unified theory of acceptance and use of technology

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Abstract

Purpose – This study aims to explain the factors affecting students' acceptance and usage of a lecture capture system (LCS) – ReWIND – in a Malaysian university based on the extended unified theory of acceptance and use of technology (UTAUT2) model. Technological advances have become an important feature of universities' plans to improve the flexibility and accessibility in a learning and teaching environment. For private universities, which are market-driven, it is vital to assess if these technologies influence the perceptions and behaviour of their target beneficiaries.

Design/methodology/approach – The study is designed using a causal research design to examine the cause–effect relationship between the study variables. The study sample consists of 398 students selected via purposive sampling. Data are collected using a five-point Likert scale covering UTAUT2's factors and variables featuring ReWIND's acceptance and usage. Partial least squares-based structural equation modelling is used to analyse the data.

Findings – The findings show that performance expectancy, effort expectancy, social influence, facilitating conditions, price–value, hedonic motivation and habit have significant influence on students' acceptance and usage of ReWIND.

Research limitations/implications – This research examines the factors affecting students' acceptance and usage of ReWIND in a Malaysian university. The main limitation of this study is that it focuses only on the factors highlighted in the UTAUT2 model.

Practical implications – The results provide a useful framework to the universities for the successful implementation of student-friendly technologies such as ReWIND to enhance their learning experience.

Originality/value – Responding to the need of studies validating the UTAUT2 model in the adoption and use of different technologies, this study contributes to the literature by extending the UTAUT2 into the context of LCS at a private university in a developing country.

Keywords Malaysia, Structural equation modelling, Interactive learning, Lecture capture system, UTAUT2 model

Paper type Research paper

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Introduction

Technological advances have an integral role in changing and facilitating people's lives in various areas including communication, health and economy. In this context, many educational reforms in the world are based on the integration of technology into different aspects of education (Tosuntas *et al.*, 2014). With the increasing use of technology, the past two decades have seen a substantial increase in the development of new and different approaches to education that have created a global impact (Chow, 2013). Nonetheless, the incorporation of technology into these different educational approaches has led to a leaner, supportive and flexible educational system (Lee, 2010). Many developed countries including USA, Australia, Italy, The Netherlands, New Zealand and the UK have undertaken large-budget projects to integrate technological advancements into their educational environment (Cheng, 2009; Chow, 2013; Makki and Makki, 2012; Türel, 2011). Hence, these technological advancements not only support the traditional learning but also complement new forms of learning (e.g. e-learning) by using the Internet and other information-related technologies and create experiences that nurture and support the learning process (Stantchev *et al.*, 2014).

One of the main objectives of higher education in today's information technology-enabled classroom is to make students more active in the learning process (Saadé *et al.*, 2012). Among the tools available to do so are Web-based lecture technologies. These systems, known as lecture capture systems (LCS) too, are distributed digital recording systems used to capture face-to-face lectures for Web delivery. These recordings are converted into streaming media formats available for access 24 × 7. These systems enable expansion of delivery options into remote or international markets and also offer more flexibility to students (Fardon, 2003).

Similar to these LCS around the world, to achieve the most effective usage of technology in a higher learning institution, Taylor's University in Malaysia has also implemented a project called "ReWIND" starting from April 2012. ReWIND is an LCS that allows lectures to be recorded automatically and made available to students digitally. It has various advantages for students, who are able to fast-forward, rewind or skip to particular segments of the recordings, gaining better understanding on topics missed out in the class (INTELLECT, 2014). The LCS used at Taylor's University consists of a combination of hardware and software. It captures a number of different media at once. An external video camera captures the video of the lecturer. The audio, captured through the lecturer's wireless microphone, is recorded and relayed to the system. Finally, the VGA signal, normally sent directly to the projector, is rerouted through the LCS, where it is recorded along with the audio and video of the presenter. The LCS automatically adjusts the recording and synchronization of the recorded audio, the video and the VGA signal. When the recording is complete, it is automatically uploaded to a server and made available for students. Instead of jotting down lecture notes hastily in class, students are able to learn at one's own pace anytime and anywhere by viewing the recorded lectures over and over again. This innovation in learning allows learners to view recorded lecture easily and promotes self-paced revision, hence students no longer have to worry if they have to miss a class due to unforeseen circumstances. With the ReWIND LCS, extensive content can be now covered in a short period by innovating how the content is distributed to the students. It enables lecturers to teach comprehensively by implementing e-Lecture inside their contents. The combination of the face-to-face and e-Lecture give students a better learning

opportunity. It also adapts to diverse, student-focused learning styles to improve the learning outcomes of the delivery. Since January 2013 till October 2014, ReWIND has been implemented in 22 lecture theatres at Taylor's University, with a total of 16,427 recordings, 223,171 views, 3,127 total downloads and 57,709.5 hours spent by students in revising the recorded lectures (INTELLECT, 2014).

As these systems are developed to support student learning (Gorissen *et al.*, 2012), understanding the adoption behaviours of these technologies is important because acceptance is a prerequisite for participation (Cheung and Vogel, 2013). Studies to date on the use and uptake of LCS have explored the technical and operational issues surrounding its access and use. Few have addressed issues around the students' adoption of these systems and its implications for teaching and learning in different contexts (Gorissen *et al.*, 2012; Gosper *et al.*, 2007). Considering the important role of students' adoption of these technologies for their implementation and sustainability, examining the factors affecting the acceptance and use of LCS is an important stage. Therefore, the current study attempts to investigate students' acceptance and usage of ReWIND at Taylor's University by using the extended unified theory of acceptance and use of technology (UTAUT2) as the theoretical base (Venkatesh *et al.*, 2012). In addition, unlike many prior studies that were conducted in developed countries such as the USA, Korea and New Zealand (Yang, 2013), this study examines the determinants of the adoption and usage of LCS in Malaysia. Thus, this study contributes to the literature by extending the UTAUT2 into the context of LCS at a private university in a developing country.

The remainder of this paper is structured as follows. The next section presents the review of the literature and hypotheses. Following that, the methodology used for sample selection and data collection is discussed. Then, data analysis and results are examined. Finally, the paper ends with a discussion of research findings, future research and concluding remarks.

Literature review

UTAUT2 and research hypotheses

Unified theory of the acceptance and use of technology (UTAUT) was proposed by Venkatesh *et al.* (2003) to explain the factors that affect the acceptance and usage of ICTs by employees. It was proposed based on experimental combination of eight distinct theoretical models taken from sociological and psychological theories utilized in the literature to explain the acceptance and use of a new technology (Venkatesh *et al.*, 2003). These eight models and theories in the literature are:

(1) Theory of Reasoned Action (TRA);
(2) Technology Acceptance Model (TAM);
(3) T Motivational Model (MM);
(4) T Theory of Planned Behaviour (TPB);
(5) T Combined TAM and TPB (C-TAM-TPB);
(6) T Model of PC Utilization (MPCU);
(7) T Innovation Diffusion Theory (IDT); and
(8) T Social Cognitive Theory (Tosuntas *et al.*, 2014).

UTAUT has become a widely used model to study applications of ICTs in various contexts including mobile banking (Zhou *et al.*, 2010), mobile phone technologies (Zhou, 2011), location-based services (Xu and Gupta, 2009), Internet banking (Riffai *et al.*, 2012), e-government (Schaupp *et al.*, 2010), e-recruiting (Laumer *et al.*, 2010) and virtual learning technologies (Chiu and Wang, 2008; Van Raaij and Schepers, 2008; Wang *et al.*, 2009).

UTAUT includes four essential determining components of *behavioural intention* or *use behaviour* on the acceptance of the technology, including performance expectancy (PE), effort expectancy (EE), facilitating conditions (FC) and social influence (SI). To adapt this model for consumers' acceptance and usage of technologies, Venkatesh *et al.* (2012) proposed the UTAUT2 by integrating three new constructs, i.e. hedonic motivation, price value and habit and new relationships (Venkatesh *et al.*, 2012). These three new factors are based on the revisions of the TAM and the UTAUT model by Venkatesh *et al.* (2003), the extended TAM (van derHeijden, 2004), the concept of habit (Limayem *et al.*, 2007), the use of technology (Burton-Jones and Straub, 2006) and the continuance of ICT usage (Thong *et al.*, 2002). Moreover, UTAUT2 also modified the conceptual definitions of its seven factors as shown in Table I.

As per Tosuntas *et al.* (2014), UTAUT is widely used to assess usage of various technologies and in different contexts. It explains 70 per cent of the technology usage. Therefore, it can be concluded that the basic four factors of UTAUT, i.e. performance expectancy, effort expectancy, social influence and facilitating conditions, are significant predictors of acceptance and use of the technology (El-Gayar *et al.*, 2011; Hsu, 2012; Ifenthaler and Schweinbenz, 2013; Sumak *et al.*, 2010). In addition to the inclusion of these four factors, hedonic motivation was incorporated in UTAUT2 to consider the extrinsic motivation or utilitarian value (Venkatesh *et al.*, 2012). Contextually, Thong *et al.* (2002) observed the significant influence of hedonic motivation on the intention to use a technology and the actual use of that technology. This relationship is also supported by other scholars, including Brown and Venkatesh (2005), Childers *et al.* (2001) and Escobar-Rodríguez and Carvajal-Trujillo (2014). Moreover, UTAUT2 also incorporated price value – the monetary cost that the consumer could incur by using the technology, which is a significant determinant of the consumers' use of technology

Table I.
Definition of constructs in the UTAUT2

No.	Factor	UTAUT2 definition
1	Performance expectancy	The degree to which using a technology will provide benefits to consumers in performing certain activities
2	Effort expectancy	The degree of ease/effort associated with consumers' use of the technology
3	Social influence	The consumers perceive that important others (e.g. family and friends) believe that they should use a particular technology
4	Facilitating conditions	Consumers' perceptions of the resources and support available to perform a behaviour
5	Hedonic motivation	The pleasure or enjoyment derived from using a technology
6	Price–value	Consumers' cognitive trade-off between the perceived benefits of the applications and the monetary cost of using them
7	Habit	The extent to which people tend to perform behaviours automatically because of learning

Source: Adapted from: Escobar-Rodríguez and Carvajal-Trujillo (2014, p. 73)

(Escobar-Rodríguez and Carvajal-Trujillo, 2014; Venkatesh *et al.*, 2012). The third factor incorporated in the UTAUT2 is consumers' habit, which has also been observed as a significant determinant of technology usage (Limayem *et al.*, 2007). Moreover, Kim and Malhotra (2005) also argued that "prior use/habit" is a relevant factor to determine the use of technology. To summarize, the UTAUT2 model reflects that an individual's intention to use a technology is determined by seven factors:

(1) performance expectancy;
(2) effort expectancy;
(3) facilitating conditions;
(4) social influence;
(5) hedonic motivation;
(6) price value; and
(7) habit.

In contrast, the actual use made of that technology is influenced by three factors:

(1) behavioural intention;
(2) facilitating conditions; and
(3) habit.

The objective of the UTAUT2 is to adapt the UTAUT specifically to the consumer use context by understanding and incorporating the fundamental constructs that influence the consumer and the relationships between those constructs. In this study, the UTAUT2 is applied to analyse students' intentions to use and actual usage of an LCS, ReWIND, at Taylor's University, a private higher education service provider in Malaysia. Taking into account the relationships and constructs of the UTAUT2 model, and the literature reviewed previously, we put forward the following hypotheses:

H1. Performance expectancy has a significant effect on students' intention to use ReWIND.

H2. Effort expectancy has a significant effect on students' intention to use ReWIND.

H3. Social influence has a significant effect on students' intention to use ReWIND.

H4. Facilitating conditions have a significant effect on students' intention to use ReWIND.

H5. Hedonic motivation has a significant effect on students' intention to use ReWIND.

H6. Price–value has a significant effect on students' intention to use ReWIND.

H7. Habit has a significant effect on students' intention to use ReWIND.

H8. Facilitating conditions has a significant effect on students' usage of ReWIND.

H9. Habit has a significant effect on students' usage of ReWIND.

H10. Students' intention to use ReWIND has a significant effect on students' usage of ReWIND (Figure 1).

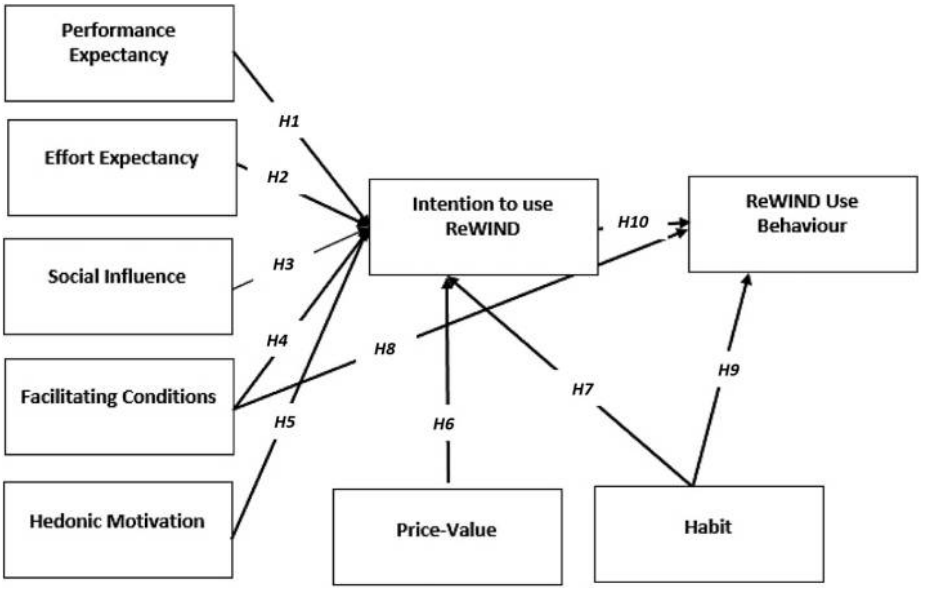

Figure 1.
Research framework

Methodology

Research instrument

A set of measurement items in respect of technology acceptance literature (i.e. the original UTAUT model, the UTAUT2, other studies and associated theories) were adapted to the specific context of this study on the acceptance and usage of LCS in a university (Escobar-Rodríguez and Carvajal-Trujillo, 2014; Tosuntas *et al.*, 2014; Venkatesh *et al.*, 2003, 2012; Yang, 2013). Following the procedure described, a total of 27 items were obtained as shown in Table II. It can be seen that the performance expectancy, effort expectancy, social influence and facilitating conditions are all measured using four items each. Hedonic motivation and habit are also measured using three items each, whereas price-value was measured using two items. The behavioural intention construct is measured by three items, and the use behaviour construct comprises one item. The responses of the survey participants to each of the items were measured on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), except for the use behaviour. It was measured on a five-point scale ranging from 1 (never) to 5 (many times). The items in the questionnaire were validated based on the opinions of a panel of academics, who were asked whether the items were appropriate for analysing students' acceptance and use of LCS. Based on the panel's opinions, a number of modifications were made to the items to make the meanings clearer. A pre-test was then carried out on 50 selected students of different genders and majors who had previously used LCS using quota and convenience sampling. This ensured that those students who had not previously used LCS were eliminated from the pre-test. Based on the results of this pre-test, only minor modifications were made to the wording of some items to increase clarity further. The minor modifications were made in few words that the individuals highlighted as being unclear.

Constructs and measurement items	Loadings	AVE	CR
Performance expectancy (PE)		0.798	0.940
I find ReWIND useful in my studies	0.893		
Using ReWIND enables me to accomplish my tasks better	0.926		
Using ReWIND increases my productivity	0.890		
Using ReWIND increases my chances of getting a good grade	0.862		
Effort expectancy (EE)		0.717	0.910
My interaction with ReWIND is clear and understandable	0.842		
It is easy for me to become skilful at using ReWIND	0.846		
I find ReWIND easy to use	0.839		
Learning to operate ReWIND is easy for me	0.860		
Social influence (SE)		0.682	0.895
People who influence my behaviour think that I should use ReWIND	0.860		
People who are important to me think that I should use ReWIND	0.879		
Teachers in my classes have been helpful in the use of ReWIND	0.784		
In general, the university has supported the use of ReWIND	0.775		
Facilitating conditions (FC)		0.655	0.881
I have the resources necessary to use ReWIND	0.895		
I have the knowledge necessary to use ReWIND	0.892		
ReWIND is compatible with other systems I use	0.830		
A specific person (or group) is available for assistance with ReWIND difficulties (deleted because of low factor loadings)	0.580		
Hedonic motivations (HM)		0.892	0.961
Using ReWIND is fun for me	0.943		
Using ReWIND is entertaining for me	0.952		
Using ReWIND is enjoyable for me	0.939		
Price–value (PV)		0.888	0.941
ReWIND is a good value for the money I pay as my fee	0.940		
ReWIND provides a good value	0.945		
Habit (H)		0.798	0.922
The use of ReWIND has become a habit for me.	0.903		
I am used to using ReWIND	0.917		
I must use ReWIND	0.859		
Intention to use (BI)		0.843	0.941
I intend to use ReWIND in the next semesters	0.908		
I would recommend my friends to use ReWIND in the next semesters	0.946		
I would say positive things about using ReWIND	0.900		
Use behaviour (UB)	Single-item construct		
Frequency of usage per week	1.000		1.000

Table II.
Constructs validity

Sampling procedures

The data were collected at Taylor's University, Malaysia, using a survey approach. Respondents were recruited via campus email. The related department at the university sent an email message to students with an invitation to participate in the survey. A link to a website was included in the email, so respondents could click through to participate.

The survey took about 10 minutes to complete. Data were collected from 416 students of a wide range of academic programmes, including law, business, hospitality & tourism, engineering and architecture, etc. All of these returned questionnaires were screened for missing data and following that, 398 were deemed fit for further analysis. Among these 398 respondents, 37 per cent were male, whereas 63 per cent were female. In all, 33 per cent of the respondents were under 20 years old, whereas 55 per cent were in the age group of 21-30 years old. With regard to their current academic year, 45 per cent were registered in their first year, 43 per cent were registered for their second year, 10 per cent were registered in their third year and 2 per cent were registered for their fourth year. Students were also asked since when they were using the ReWIND system: 29 per cent of them were using it since zero to one semester, 41 per cent were using it since two to three semesters and another 23 per cent were using it since more than three semesters. With regards to the training provided for usage of ReWIND by the related department, 29 per cent of the students got less than an hour training, 30 per cent got training for one to two hours and another 25 per cent got training for more than two hours to use ReWIND.

Analytical methods

For this study, statistical analysis and hypotheses were tested using structural equation modelling (SEM) by performing the partial least squares (PLS) approach. To conduct the analysis, SmartPLS software, Version 3.0 (Ringle *et al.*, 2005), was used. Despite criticism, PLS is a well-established technique for estimating path coefficients in structural models and has become increasingly popular in marketing research more generally in the past decade because of its ability to model latent constructs under conditions of non-normality and small-to-medium sample sizes (Hair *et al.*, 2013; Ali *et al.*, 2014). In addition, PLS analysis was performed and found to be suitable in this study, as one construct of the study was a single-factor item (Hair *et al.*, 2013). PLS algorithm procedure was performed to determine the significance levels of the loadings, weights and path coefficients, followed by the bootstrapping technique (5000 resample), which was applied to determine the significance levels of the proposed hypotheses. Following the procedure suggested by Anderson and Gerbing (1988), validity and goodness of fit of measurement model were estimated before testing the structural relationships outlined in the structural model. Finally, the blindfolding procedure (Q^2) was used to determine and assess the accuracy of tested hypotheses.

Common method bias

Recent scholars have suggested assessing data for common method variance, which may exist because of using a single survey method while collecting the data (Podsakoff *et al.*, 2003). Common method variance is considered as a potential problem in behavioural research (Rezaei and Ghodsi, 2014). To address the concern of common method variance, the data in this study were examined using Harman's one-factor test (Podsakoff *et al.*, 2003). The items from all of the constructs in this study were considered in a factor analysis to determine whether the majority of the variance could be accounted for by one general factor. The results of the principal component factor analysis revealed three factors with eigenvalues greater than 1 explaining 61.4 per cent of the total variance. The first factor accounted for 43.9 per cent (less than 50 per cent) of the

variance, which did not account for a majority of the variance (Podsakoff *et al.*, 2003). Therefore, it was concluded that the data for this study did not suffer from common method bias.

Results

Measurement model

As discussed above, to evaluate reflectively measurements models, we examine outer loadings, composite reliability (CR), average variance extracted (AVE = convergent validity) and discriminant validity. First, the measurement model was tested for convergent validity. This was assessed through factor loadings, CR and AVE (Hair *et al.*, 2006). Table II shows that all item loadings exceeded the recommended value of 0.6 (Chin, 1998). CR values, which depict the degree to which the construct indicators indicate the latent construct, exceeded the recommended value of 0.7 (Hair *et al.*, 2006), while AVE, which reflects the overall amount of variance in the indicators accounted for by the latent construct, exceeded the recommended value of 0.5 (Hair *et al.*, 2006).

The next step was to assess the discriminant validity, which refers to "the extent to which the measures are not a reflection of some other variables", and it is indicated by the low correlations between the measure of interest and the measures of other constructs (Ali and Amin, 2014; Ramayah *et al.*, 2013, p. 142). Table III shows that the square root of the AVE (diagonal values) of each construct is larger than its corresponding correlation coefficients, pointing towards adequate discriminant validity (Fornell and Larcker, 1981). Thus, the measurement model showed an adequate convergent validity and discriminant validity.

Furthermore, comparing the loadings across the columns in Table IV also indicates that an indicator's loadings on its own construct are in all cases higher than all of its cross-loadings with other constructs. Thus, the results indicate there is discriminant validity between all the constructs based on the cross-loadings criterion.

Structural model

SmartPLS 2.0 was used to test the structural model and hypotheses (Ringle *et al.*, 2005). A bootstrapping procedure with 2000 iterations was performed to examine the statistical significance of the weights of sub-constructs and the path coefficients (Chin

Constructs	PE	EE	SI	FC	HM	PV	H	BI	UB
PE	0.893								
EE	0.655	0.846							
SI	0.490	0.507	0.825						
FC	0.580	0.706	0.493	0.809					
HM	0.576	0.545	0.529	0.481	0.944				
PV	0.549	0.529	0.382	0.508	0.492	0.942			
H	0.677	0.57	0.524	0.488	0.627	0.540	0.893		
BI	0.735	0.647	0.528	0.623	0.608	0.646	0.720	0.918	
UB	0.725	0.573	0.486	0.548	0.591	0.562	0.744	0.833	1.000

Notes: The square root of AVE of every multi-item construct is shown on the main diagonal; UB is a single-item construct

Table III.
Discriminant validity

Items	BI	EE	FC	H	HM	PE	PV	SI	UB
BI1[a]	**0.908**	0.585	0.577	0.684	0.540	0.684	0.575	0.443	0.757
BI2	**0.946**	0.602	0.572	0.686	0.582	0.701	0.579	0.514	0.806
BI3	**0.900**	0.596	0.568	0.611	0.554	0.636	0.629	0.497	0.729
EE1	0.587	**0.842**	0.616	0.516	0.479	0.615	0.428	0.436	0.545
EE2	0.552	**0.846**	0.570	0.531	0.495	0.612	0.429	0.418	0.528
EE3	0.517	**0.839**	0.582	0.405	0.401	0.476	0.465	0.414	0.409
EE4	0.532	**0.860**	0.624	0.471	0.466	0.506	0.471	0.449	0.447
FC1	0.549	0.612	**0.895**	0.449	0.420	0.535	0.472	0.435	0.501
FC2	0.585	0.628	**0.892**	0.465	0.410	0.552	0.455	0.376	0.504
FC3	0.501	0.629	**0.830**	0.361	0.360	0.459	0.382	0.351	0.442
FC4	0.350	0.382	**0.580**	0.279	0.383	0.287	0.324	0.488	0.293
H1	0.596	0.492	0.411	**0.903**	0.590	0.594	0.437	0.490	0.648
H2	0.684	0.586	0.497	**0.917**	0.587	0.620	0.526	0.481	0.677
H3	0.646	0.445	0.397	**0.859**	0.505	0.598	0.480	0.433	0.667
HM1	0.592	0.535	0.489	0.584	**0.943**	0.559	0.505	0.485	0.560
HM2	0.547	0.496	0.442	0.575	**0.952**	0.509	0.432	0.508	0.520
HM3	0.582	0.511	0.430	0.617	**0.939**	0.561	0.454	0.507	0.592
PE1	0.693	0.593	0.537	0.602	0.497	**0.893**	0.478	0.449	0.643
PE2	0.683	0.610	0.538	0.639	0.520	**0.926**	0.533	0.434	0.680
PE3	0.624	0.567	0.509	0.595	0.521	**0.890**	0.495	0.409	0.619
PE4	0.621	0.570	0.487	0.580	0.521	**0.862**	0.455	0.460	0.647
PV1	0.595	0.463	0.471	0.504	0.456	0.497	**0.940**	0.376	0.498
PV2	0.623	0.532	0.487	0.514	0.471	0.537	**0.945**	0.345	0.559
SI1	0.415	0.421	0.371	0.472	0.506	0.447	0.345	**0.860**	0.433
SI2	0.494	0.443	0.426	0.501	0.502	0.450	0.345	**0.879**	0.454
SI3	0.340	0.381	0.351	0.331	0.332	0.313	0.217	**0.784**	0.294
SI4	0.466	0.421	0.462	0.401	0.385	0.389	0.333	**0.775**	0.398
U1	0.833	0.573	0.548	0.744	0.591	0.725	0.562	0.4860	**1.000**

Table IV.
Cross-loadings

Note: [a]Bold values are loadings for items which are above the recommended value of 0.5

et al., 2008). As PLS does not generate overall goodness of fit indices, R^2 is the primary way to evaluate the explanatory power of the model (Wasko and Faraj, 2005). However, another diagnostic tool is presented by Tenenhaus *et al.* (2005) to assess the model fit and is known as the goodness of fit (GoF) index. The GoF measure uses the geometric mean of the average communality and the average R^2 (for endogenous constructs). Hoffmann and Birnbrich (2012) report the following cut-off values for assessing the results of the GoF analysis: GoFsmall = 0.1; GoFmedium = 0.25; GoFlarge = 0.36. For the model used in this study, a GoF value of 0.740 is calculated, which indicates a very good model fit, as shown in Table V.

Following the measurement model and goodness of fit, the hypothesized relationships in the structural model were tested. Figure 2, shows the results of the analysis. The corrected R^2s in Figure 2 refer to the explanatory power of the predictor variable(s) on the respective construct. All the seven constructs of the UTAUT2 model, including performance expectancy, effort expectancy, facilitating conditions, social influence, hedonic motivation, price–value and habit, explain 70.7 per cent per cent of students' intentions to use ReWIND (R^2= 0.707).

Constructs	AVE	R^2
PE	0.798	
EE	0.717	
SI	0.682	
FC	0.655	
HM	0.892	
PV	0.888	
H	0.798	
BI		0.707
UB		0.737
Average scores	0.775	0.707
AVE * R^2	0.548	
($GOF = \sqrt{AVE \times R^2}$)	0.740	

Table V.
Goodness of fit index

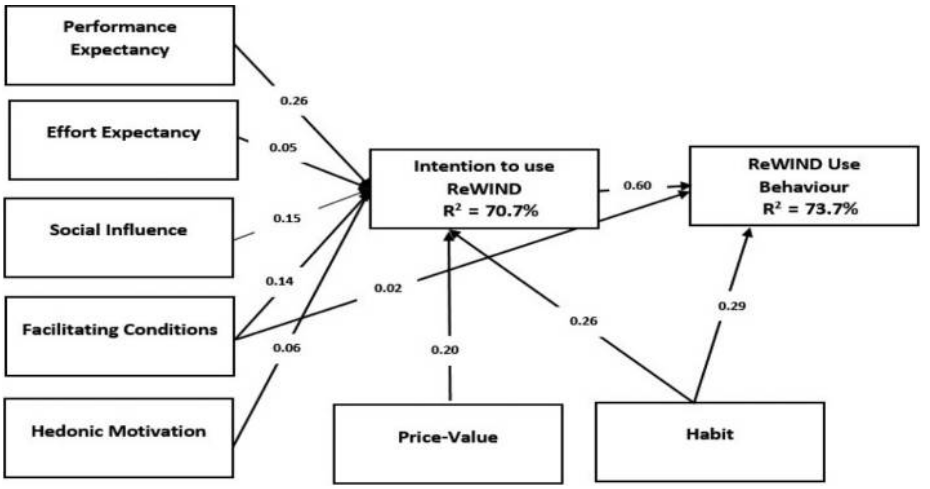

Figure 2.
Structural model results

Whereas behavioural intention, facilitating conditions and habit explain 73.7 per cent of students' actual use of ReWIND ($R^2 = 0.737$). In regard to model validity, Chin *et al.* (2008) classified the endogenous latent variables as substantial, moderate or weak based on the R^2 values of 0.67, 0.33 or 0.19, respectively. Accordingly, intention to use ReWIND ($R^2 = 0.707$) and ReWIND usage behaviour ($R^2 = 0.737$) can be described as substantial.

In addition to the size of R^2, the predictive sample reuse technique (Q^2) can effectively be used as a criterion for predictive relevance (Chin *et al.*, 2008). This test follows a blindfolding procedure in which part of the data are omitted for a given construct while the parameters are estimated, so as to then attempt to estimate what has been omitted by using the estimated parameters (Chin, 2010). Based on the blindfolding procedure, Q^2 shows how well the collected data can be reconstructed empirically with the help of a model and the PLS parameters (Akter *et al.*, 2011). For this study, Q^2 was obtained using cross-validated redundancy procedures as suggested by Chin (2010). As per Fornell and

Cha (1993), a Q^2 greater than 0 means that the model has predictive relevance, whereas Q^2 less than 0 means that the model lacks predictive relevance. As shown in Table VI, Q^2 for intentions to use and usage behaviour are 0.580 and 0.728, respectively, indicating acceptable predictive relevance.

Moreover, the complete results of the structural model and hypotheses testing are presented in Table VII. The results from the structural model showed a strong support for all the ten hypotheses of the study.

Discussion and implications

Considering the important role of students' adoption of various technologies for their implementation and sustainability, the current study attempted to investigate students' acceptance and usage of an LCS – ReWIND – at Taylor's University, Malaysia, by using the UTAUT2 as the theoretical base. These findings indicated that the significant predictors of students' intentions to use ReWIND in order of relevance are performance expectancy, habit, price value, social influence, facilitating conditions, hedonic motivations and effort expectancy. Thus, intention to use ReWIND depends on the students' improved level of performance expected by its usage, individual habit of using it, value obtained by its usage, influence of the social circle, availability of facilitating conditions, fulfilment of hedonic motives and its ease of use. On the other hand, the findings also reported that the significant predictors of use behaviour in order of importance include usage intentions, habit and facilitating conditions. Hence, students' usage behaviour depends on their intention to use ReWIND, the individual habit in using it and the facilitating conditions available to students. Figure 2 summarizes the PLS structural analysis results, whereas Table VII reports the hypotheses testing. These findings and comparisons are detailed in the paragraphs below.

H1 and *H2* were hypothesizing that students' performance expectancy and effort expectancy influence their intentions to use ReWIND significantly. The results show a

Table VI. Results of R^2 and Q^2 values

Endogenous constructs	R^2	Q^2
Intention to use (BI)	0.707	0.580
Use behaviour (UB)	0.737	0.728

Table VII. Structural estimates (hypotheses testing)

Hypotheses	Beta	Error	*t*-value	*p*-value
H1. Performance expectancy → Intentions to use	0.263	0.051	5.140	0.000
H2. Effort expectancy → Intentions to use	0.054	0.053	4.019	0.000
H3. Social influence → Intentions to use	0.150	0.044	16.146	0.000
H4. Facilitating conditions → Intentions to use	0.143	0.052	8.763	0.000
H5. Hedonic motivation → Intentions to use	0.066	0.044	11.508	0.000
H6. Price-value → Intentions to use	0.208	0.042	4.981	0.000
H7. Habit → Intentions to use	0.262	0.048	5.452	0.000
H8. Facilitating conditions → Usage behaviour	0.027	0.038	10.714	0.000
H9. Habit → Usage behaviour	0.297	0.052	5.691	0.000
H10. Intentions to use → Usage behaviour	0.602	0.055	10.942	0.000

strong support for these hypotheses (*H1*: b = 0.263, $t = 5.140$, sig < 0.01; *H2*: b = 0.054, $t = 4.019$, sig < 0.01). This implies that performance expectancy and effort expectancy of students have a significant influence on their intentions to use ReWIND. These are in line with the previous studies discussing the relationship between performance expectancy, effort expectancy and behavioural intentions (Meng and Wang, 2012; Moran *et al.*, 2010; Venkatesh *et al.*, 2003; Wong *et al.*, 2013a, 2013b). Tosuntas *et al.* (2014) used "Unified Theory of Acceptance and Use of Technology" (UTAUT) to study the acceptance of interactive whiteboard in education and observed that performance expectation and effort expectancy influence behavioural intentions of the users significantly. In another study, Escobar-Rodríguez and Monge-Lozano (2012) used "Technology Acceptance Model" (TAM) to study the acceptance of the Moodle technology by business administration students and observed that perceived usefulness develops performance expectation and effort expectancy, which influence behavioural intention significantly. The significant effect of performance expectancy and effort expectancy towards usage intentions means that students believe that use of ReWIND technology improves their performance and is easy to use. The significant effect of performance expectancy on usage intentions can be interpreted as students with higher performance expectation aim to use ReWIND more as compared to those with low expectation. Moreover, the significant effect of effort expectancy on usage intentions can be interpreted as perceiving ReWIND as an easy-to-use and user-friendly tool is an important factor. Therefore, the software and hardware difficulties experienced during the usage of the ReWIND and how to resolve these difficulties is another important matter to focus on. Moreover, previous literature also stated that performance expectancy influences behavioural intentions more strongly as compared to effort expectancy (Meng and Wang, 2012; Tosuntas *et al.*, 2014); therefore, it can be implied that students use ReWIND because of its influence on their performance as compared to its ease of use.

In addition, a support was also found for *H3* hypothesizing the significant effect of students' social influence on their intentions to use ReWIND (*H3*: b = 0.150, $t = 16.146$, sig < 0.01). Confirmation of this hypothesis confirms the previous literature that social influence has a significant influence on usage intention within the higher education sector (Escobar-Rodríguez and Monge-Lozano, 2012; Tosuntas *et al.*, 2014). The significant impact of social influence on usage intentions has also been observed in other contexts (Venkatesh and Davis, 2000; Wong *et al.*, 2013a, 2013b). For instance, Lian (2015) observed that social influence significantly affects customers' adoption of e-invoice services. In another study, Escobar-Rodríguez and Carvajal-Trujillo (2014) confirmed the significant relationship between social influence and customers' adoption of online ticket purchasing for low-cost airlines. The significant effect of social influence is the result of that the use of ReWIND was deemed necessary by those who were important for the students, including their lecturers and class fellows. Hence, social influence can be seen as an advantage by the administration of Taylor's University and also other higher education service providers in creating usage intention towards LCS such as ReWIND. If students are instructed strictly by the administration and lecturers to used ReWIND and/or if some students start adopting and using ReWIND, the participation of the others will quickly increase. Therefore, relevant authorities must focus on various ways to increase students' acceptance and use of ReWIND.

Similarly, *H4* and *H8* were hypothesizing that facilitating conditions influence students' intentions to use and usage behaviour towards ReWIND significantly. The results show a strong support for these hypotheses as well (*H4*: b = 0.143, t = 8.763, sig < 0.01; *H8*: b = 0.027, t = 10.714, sig < 0.01). With the acceptance of both these hypotheses, it has been observed that facilitating conditions have significant effect on both – the usage intentions and usage behaviour. Similar results have been observed in the previous studies examining the effects of facilitating conditions on users' intentions and actual behaviour (Meng and Wang, 2012; Tosuntas *et al.*, 2014). This significant effect implies that it is important for organizations to have institutional and technical infrastructure for supporting students' intentions to use and actual usage of ReWIND. Universities such as Taylor's University must ensure that students have quick access to the resources necessary for the use of LCS. For this purpose, regular training can be organized in various schools/departments; experts may offer continuous consultancy and support to the students or a dedicated chat room or communication channel via social media platforms, i.e. Facebook, may also be established to provide instant solution to the encountered problems.

H5 was hypothesizing that students' hedonic motivation influences their intentions to use ReWIND significantly. The results show a support for this hypothesis (*H5*: b = 0.066, t = 11.508, sig < 0.01). Traditionally, the students attend the lectures by sitting in the classrooms and listening to the lecturers delivering the lecture. The fact that hedonic motivation does influence the usage intentions significantly can be explained because students can access captured lectures from anywhere and can rewind or forward the lectures as per their choice, which is more entertaining and enjoyable as compared to the traditional lectures. Saade and Kira (2006) in their study on undergraduate students' acceptance of Web-based learning system also observed that emotions of students are main drivers of their perceptions and intentions to use the Web-based learning system. These findings are supported by other researchers as well (Escobar-Rodríguez and Carvajal-Trujillo, 2014; Venkatesh *et al.*, 2012). Moreover, *H6* was hypothesizing that price–value influences students' intentions to use ReWIND significantly. The results show a strong support for this hypothesis (*H6*: b = 0.208, t = 4.981, sig < 0.01). With regard to price–value, it can be said that it plays a relevant role as a significant driver of users' usage intentions (Escobar-Rodríguez and Monge-Lozano, 2012). It implies that the greater the chance of obtaining the best services for a given price and associated perceived benefits and value, the higher will be the intentions to use those services. Contextually, students develop intentions to use LCS due to the additional value they can obtain by paying the same fee as students from other institutes who are not provided with these technological advancements.

A support was also found for *H7* and *H9* hypothesizing the significant effect of students' habit on their intentions to use and usage behaviour towards ReWIND (*H7*: b = 0.262, t = 5.452, sig < 0.01; *H9*: b = 0.297, t = 5.691, sig < 0.01). Given the results obtained then, the greater the habit of students, the more likely they are to have a greater usage intention, and a greater probability of actual use of ReWIND. Therefore, it is suggested that Taylor's University should develop rules and regulations that may ensure the consistent usage of LCS by students which can develop their habit of using it. Once students develop their habit of using technologies such as ReWIND to support their learning experience, their usage behaviour will automatically improve. Nonetheless, a support was also found for

H10 hypothesizing the significant effect of students' intentions to use ReWIND on their actual usage (*H10*: b = 0.602, t = 10.942, sig < 0.01). It implies that the greater the perceived usage intentions towards ReWIND are, the greater the chance of actual usage will be. Therefore, universities should try to develop students' intentions to use ReWIND as a supplemental tool for better learning and experience to increase actual usage. Factors such as habit, price value, hedonic motivation, facilitating conditions, social influence, performance and effort expectancy can all be acted upon to improve students' usage intentions.

This research has investigated the factors affecting students' acceptance and use of an LCS in terms of the relationships among determinants of UTAUT2 model, usage intention and use behaviour. It is believed that the findings obtained from the research will provide a useful framework to the universities for the successful implementation of student-friendly technologies such as ReWIND to enhance their learning experience and to the researchers to maintain the validity of UTAUT2 model in the adoption and use of different technologies. However, like all other researches, this study has its limitations which pave the ways for future research. For instance, future studies may also want to continue to investigate the moderating variables in the UTAUT2 model (e.g. gender, age), which were excluded in the current research model. Moreover, this study only considered the factors included in the UTAUT2 model. It is recommended that future studies should focus on analysing the influence of other constructs on students' acceptance and usage of learning technologies. These other constructs could include students' experience with the usage of technologies, students' personality traits and technology self-efficacy. The inclusion of some of these variables may improve the prediction of both the acceptance and usage of learning technologies. Future studies could also examine the suitability of UTAUT2 model for other kinds of learning technologies such as interactive whiteboards and learning management systems. Another interesting avenue for further research might be analysing the possible cross-cultural differences in the determinant factors that influence students' acceptance and usage of learning technologies. Another interesting future research suggestion is to consider the teaching effectiveness by conducting a comparative study between students who did not use the LCS and those who used them extensively.

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