Exploring undergraduates' acceptance of electronic information resources (EIR) using technology acceptance model: A case study in Sri Lanka

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ABSTRACT

Under-utilization of Electronic Information Resources (EIR) and the importance of promoting them have been recognized in the preceding research. The study investigated the determinants behind the acceptance of EIR use by social science undergraduates in Sri Lanka using the Technology Acceptance Model. The research employed a survey design and sample of 119 social science undergraduates who are engaging in final year research. The research model performed in explaining user acceptance of EIR use. The effects of the cognitive beliefs of perceived usefulness and perceived ease of use on the behavioral intention of EIR use were examined. Perceived usefulness was identified as the major determinant on the behavior intention to use EIR. Social influence and facilitating conditions were found as significant factors which influence to the undergraduates behavior intention towards the EIR via perceived ease of use and perceived usefulness. The study suggests that both key variables and external variables that have been found to affect users' behavioral intention to use should be considered as important factors in the process of implementing and promoting EIR for social science undergraduates.

Keywords: Electronic Information Resources, Technology Acceptance Model, Perceived Usefulness, Perceived Ease of Use, Sri Lanka

INTRODUCTION

Introduction of electronic information resources (EIR) has changed the various aspects of information seekers behavior. It has changed the way information has been distributed, searched and accessed. Due to the easiness, efficiency and cost effectiveness, EIR are becoming a most important commodity among the academic community. As EIR are more important and most of University libraries have spent large

amount money to purchase online data bases, e- journals, e-books and various internets based e- resources to provide better service to their users.

Initiating of EIR into university libraries in Sri Lanka goes back to the period of two decades. At the beginning, most of the university libraries used CDS/ISIS software which was developed by the UNESCO and distributed free-of-charge to the libraries. Many university libraries created the electronic databases for their libraries to input bibliographic data using CDS/ISIS as an initial project of university library automation in Sri Lanka. In late 1990s, with the collaboration of SIDA/SAREC and INASP, Sri Lankan libraries were able to introduce several EIR such as country wide access to peer-reviewed full-text journal databases, abstracting and indexing services, establishment of a web-based facility with a view to provide wider exposure to the contents in research journals and other current research published in Sri Lanka (Kodikara 2004). After year 2000, INASP negotiated countrywide licenses for full text e-information with access to over 5000 full text online journals in science, technology, medicine, social sciences and humanities. The beneficiaries from this endeavor are for all university academics in Sri Lanka and also other higher educational, research and non-profit making institutions (Belcher n.d.). At present, many university libraries in Sri Lanka provide services of e-information resources such as, e-journals, e-books, databases, abstract databases, open access resources, digital repositories, CD ROMs and other internet based e-services to fulfill the users' information needs. The Sri Lankan University libraries are making every effort to allocate more funds to create and to make use and to upgrade the electronic scholarly information access within the library system.

Although the university libraries have done their best to provide EIR for undergraduates to satisfy their information requirements, still a majority of the students do not utilize these facilities in a productive way. Previous research found that usage of EIR of university undergraduates who are from Social Sciences and Humanities was not in satisfactory level (Hewagamage 2009; Dharmarathna 2008; Damayanthi and Senevirathne 2008). Although millions of money spent to introduce EIR in university libraries, there is a doubt whether these valuable resources are utilizing by undergraduates effectively and efficiently. In addition to that, sufficient research on EIR adoption and research on individual level factors that influence users' acceptance of these new systems has been rarely conducted. Further, most of prior research were focused on usage, usage patterns of EIRs by users in University sector in Sri Lanka (Punchihewa 2012; Millavitanachchi 2012; Dharmaratne 2008; Damayanthi and Senevirathne 2008).Therefore, the use of EIR has become an important research agenda, because it is needed for explaining user acceptance and it will help to understand the evaluation and planning process of how the new system can be popular among the user categories (Kim 2006). Hence it is important to identify how EIR are used and what factors affect the intention to use them.

The forgoing literature on the use of EIR findings inferred that there is still a dearth of research on identifying the factors that affect the intention to use EIR for undergraduates' learning and research process in Sri Lankan context. Therefore, the main purpose of this study is to explore the determinants that give the basis for accepting EIR use by undergraduates from Social Science in Sri Lanka. Further, the study examines the factors that most influentially affect the users' behavior. In order to

increase the use of EIR effectively, it is crucial to understand the most influential factors above said.

This study focuses on testing factors affecting user acceptance of EIR by applying the technology acceptance model (TAM) as a theoretical framework. It is important to have a theoretical understanding of user acceptance; it will provide benefits by helping to identify the factors that can influence of EIR use in implementation process.

LITERATURE REVIEW

(a) Theoretical Background

TAM, is one of widely used models in user acceptance research domain. It provides a necessary theoretical basis to explain an individual`s motives of using an information system (Kim 2006). Although, TAM has received substantially to conduct research on information system acceptance, so far there has been little research on user acceptance of EIR. Applying TAM in the context of EIR use can be advantage, because it allows to experiment on the basis of a well established theoretical foundation. A better understanding of the determinants of EIR use will have meaningful managerial implications and it can provide insights to library practitioners that facilitate the use of the EIR effectively and efficiently.

Many empirical studies have developed theoretical frameworks to understand user acceptance and usage process (Davis, Bagozzi and Warshaw 1989; Mathieson 1991; Thompson, Higgins and Howell 1991). Among that, TAM is one of the most influential and frequently tested models that have been developed to explain and predict users' information system usage behavior.

TAM attempts to identify the user acceptance of information systems. TAM has been evolved the theory of reasoned action which is a model developed to explain the determinants of conscious behavior.TAM describes theoretical basis for specifying casual linkages between the constructs in the model(Kim 2006). TAM theorizes that an individual`s behavioral intention to use a system is determined by two beliefs: perceived usefulness (PU), defined as the extent to which a person believes that using the system will enhance his or job performance, and perceived ease of use (PEOU), defined as the extent to which a person believes that using the system will be free of effort. TAM explains that the effects of external variables on intention to use are mediated by perceived usefulness and perceived ease of use (Venkatesh and Davis 2000).User beliefs are considered important in system adoption, because of their influence on usage behavior. Various theoretical perspectives such as expecting theory, self- efficacy theory, behavioral decision theory, diffusion of innovations, marketing and human computer interaction analyzed the theoretical importance of PU and PEOU (Davis, 1989). External variables are postulated to influence user beliefs. External variables provide the bridge between the internal beliefs, attitudes and intentions represented in TAM. The various individual differences, situational constraints and managerially controllable interventions implementation process, by manipulating these external factors practitioners can influence users' beliefs about the system and consequently their behavioral intention and system use (Hong, et al. 2002).
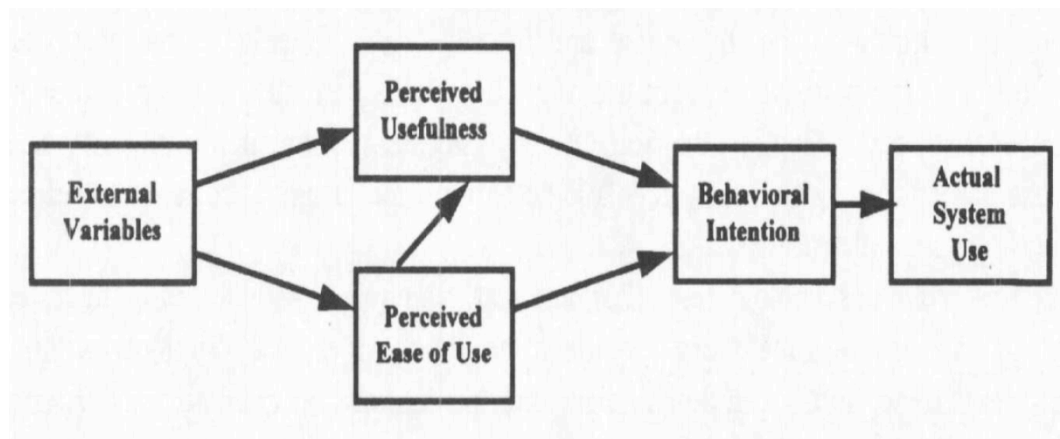
Figure 1: Technology Acceptance Model (Davis, Bagozzi and Warshaw, 1989)

(b) TAM Related Empirical Studies

TAM has been applied to numerous areas in information science. Many replication studies have supported to test validity and reliability of TAM (Adam, Nelson and Todd 1992; Hendrickson, Massey and Cranan 1993; Szajana 1994). Some researchers have attempted to integrate existing models and theories to gain a stronger model that provides more explanatory power than a model that stands alone. (Chau 1996; Dishaw and Strong 1999; Thompson et al. 1991). In addition, a number of TAM research studies done by incorporating external variables in order to improve understanding of factors that affect of new system use or acceptance(Igbaria, Livari and Maragah 1995; Venkatesh and Davis 1996; Venkatesh 2000; Venkatesh and Davis, 2000; Kim 2006; Park, et al. 2009). Researchers have incorporated various constructs such as subjective norms, system interface characteristics & system characteristics, individual differences in TAM (Jackson, Chow and Leitch 1997; Lucas and Spitler 1999; Taylor and Todd 1995; Venkatesh 1999; Masrom 2007; Park et al 2009; Jeong 2011; Hong et al. 2011). In the context of library and information science, TAM has been used to examine perceptions and behavioral intentions towards the e- library use (Jeong, 2011; Ayele and Sreenivasarao 2013). Hong et al (2002) studied the determinants of user acceptance of digital libraries and the effects of the intrinsic and extrinsic motivation factors on user acceptance by using TAM. Both perceived usefulness and perceived ease of use had a significant positive effect on behavior intention. About 52% of the variance in behavior intention with perceived usefulness (β =0.51) contributing to intention and 37% of variance in behavior intention to use the digital library with perceived ease of use (Hong

et al 2002). Study found that perceived usefulness has stronger power to explain the intention to use the digital library (Hong et al, 2002). Jeong (2011) incorporated individual differences, interface characteristics, and system characteristics in TAM as external variables in the e- library use. Those three external variables explained 40.8% of variance in the perceived ease of use. System quality had the strongest effect on the perceived ease of use. Similarly, model explained 36.9 % of the variance in the perceived ease of use and perceived usefulness. Perceived ease of use was found as the major determinant (β= 0.443) on behavior intention to use e-library system (Jeong 2011). Park et al (2009) incorporated external variables into TAM to understand the factors affect to digital library system in developing counties. Study found that 64% of variance explained by perceived usefulness on behavior intention to use of digital library system. Relevance

reported 56% of direct effect on perceived usefulness as well as 38% of indirect on behavior intention to use digital library. Study confirmed that both key variables and external variables that have been affect users' behavior intention to use digital library (Park et al 2009).

RESEARCH MODEL

The proposed research model of this study is demonstrated in figure 02, which described TAM in the context of electronic information resource usage. This model hypothesizes that users intention to use EIR is jointly determined by perceived usefulness (PU) and perceived ease of use (PEOU) and external variables. The model demonstrates that the two belief variables of PU and PEOU mediate the effects of the antecedents of beliefs on intended use. Further model incorporates external factors that have been found consistently to impact user beliefs in past research.
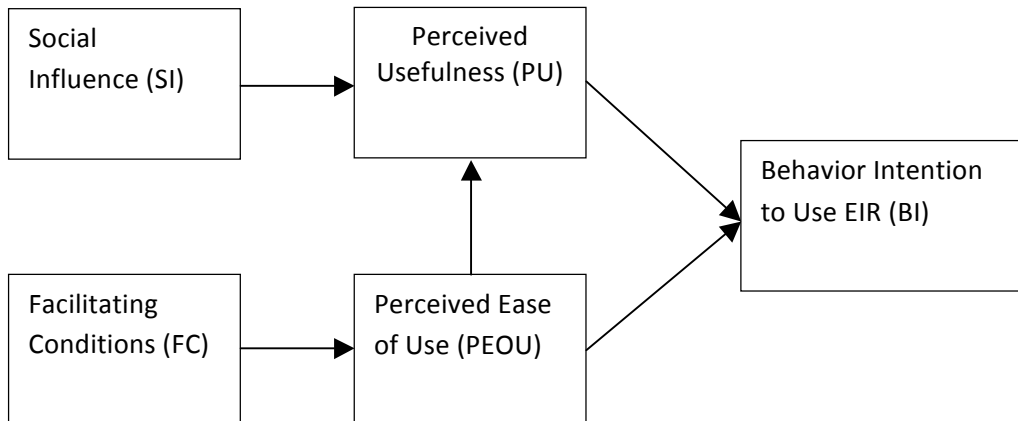

Figure 2: Proposed Research Model

In the research model, "intention to use" is applied as an indicator of user acceptance. Examining behavioral intention as an indicator of user acceptance is consistent with previous studies using TAM (Agrawal and Karahanna 2000; Kim 2006; Park et al. 2009 ; Lee 2010; Adwan, Adwan and Smedley 2013) In accordance with TAM, user beliefs about PU and PEOU are hypothesized to be positively associated with intention to use of electronic information resources. Further, PEOU is also hypothesized to have an influence on PU in that increased PEOU can contribute to improved performance.

Hypothesis1: Perceived usefulness will have positive effect on behavioral intention to use of EIR.
Hypothesis 2: Perceived ease of use will have a positive effect on behavioral intention to use of EIR.
Hypothesis 3: Perceived ease of use will have positive effect on perceived usefulness of the use of EIR.

External Variables

This study incorporates external variables for better understanding of the factors influencing user acceptance. TAM 2 discussed the usefulness perceptions and usage intentions in terms of social influences and cognitive instrumental process. It explains that social influences affect the usefulness perceptions and usage. Social influence could be defined as "the degree to which members in a society or with educational setting influence others behavior to perform a particular behavior" (Venkatesh et al.2003). Previous research found strong support for the relationship between social influence and behavioral intention (Venkatesh et al. 2003; Chau and Hu 2001; Kripanont 2007). Based on the reviewed literature the following hypotheses are formulated.

Hypothesis 4: Social influence will have a positive effect with perceived usefulness of EIR.

Venkatesh et al. (2003) have defined that facilitating conditions are "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of them." Venkatesh and Bala (2008) demonstrate that when users hold a strong believe with regard to the availability of organization resources, technical and managerial support, then, that will facilitate the adoption of technology in question(Venkatesh and Bala 2008). Previous research has also demonstrated that facilitating conditions have major role in end user behavior intentions of e-library services and internet based teaching (Kripanont 2007; Tibenderana 2010). Accordingly, it is expected that the current study assumes that in the context of EIR use, the facilitating conditions would be very important because there are facilities provided by university or library the user behavior or behavior intention would not be possible. Therefore, study theorized that facilitating conditions would directly determine and perceived ease of use.

Hypothesis 5: Facilitating conditions will have a positive effect on perceived ease of use on EIR.

Research Design

The study was a case study and adopted quantitative methods of data collection to explore the factors that impact the acceptance of EIR use. Survey method applied and purposive sampling method used to select the sample. Subjects of this research were fourth year undergraduates who are engaging final year research project. The sample consisted of 150 undergraduate students majoring in social science subjects of Faculty of Arts, University of Peradeniya, Sri Lanka. The questioners were distributed to collect data during the one month period in March 2014.

This study measured five constructs such as perceived usefulness, perceived ease of use, social influence, facilitating conditions, and behavior intention to use EIR. All measurement items used in this study were developed according to the aforementioned literature. The measurement items of perceived usefulness, perceived ease of use and behavioral intention were adopted from measurements that were originally defined by (Davis 1989) and Venkatesh and Davis (1996, 2000). The measurement items for social influence were adapted from the originally described by Kim (2006) and Krinpanot (2007). The measurement items for facilitating conditions were adapted from the

Krimpanot (2007) and Tibenderana (2010). Construct validity and reliability have been tested to ensure that the results are reliable and consistent. While reliability analysis measured, the internal validity and consistency of items used for each construct. Calculating Cronbach`s alpha coefficient tested the factor reliability. The research model consists 23 items with each construct being measures by 7 Likert scale options. A seven part Likert scale was used to gather responses response ranges from "strongly disagree (=1)" to" strongly agree (=7)".

RESULTS

Questionnaire was administrated 150 undergraduates and 119 of undergraduates dully completed and returned. Response rate is 79% of the 119 participating students 24% were male and 76% were female. The data were analyzed by using SPSS (20) and model estimation was performed by using OLS (Ordinary Leased Square) method. Factor scores were estimated by using principle component method and multiple regression analysis conducted for structural model analysis.

The study measured the construct validity and reliability to ensure that the results are reliable and consistent. The reliability analysis measured the internal validity and consistency of items used for each construct. Cronbach`s Alpha coefficient test run for the factor reliability. Factor reliability indicates the how set of items are closely related as a group. Cronbach`s alpha values for all factors are above 0.7 indicating that all measures employed in this study demonstrate a satisfactory internal consistency.

Table 1: Scale: Cronbach`s Alpha

Scale	Cronbach`s alpha
Perceived usefulness(PU)	0.818
Perceived Ease of Use(PEOU)	0.810
Social Influence (SI)	0.738
Facilitating Conditions (FC)	0.794
Behavior Intention to Use (BI)	0.868

Factor analysis performed in order to measure the convergent validity of the 23 items of the questionnaire. The convergent validity evaluates whether the items of a variable are converging together on a single construct or not (Adwan, Adwan and Smedley 2013). Table 02 displays the factor loadings of each items of questionnaire for the sample 119 social science undergraduates.

The KMO and Bartlett`s test was run for identify the correlations among the factors and to test whether the correlation matrix is an identity matrix. The KMO statistic varies between 0 and 1.The study indicates KMO value is 0.739 and Bartlett`s test shows that p ≤.000.therefore factor analysis is appropriate.

(a) Estimation of Structural Model

Standard multiple regression analysis was conducted to examine the relationships between constructs in the research model. Table 04 shows that casual paths, including path coefficients and p value explained for each equation in the hypothesized model. As

expected, hypotheses H_1 and H_2 were supported in that both perceived usefulness and perceived ease of use have a significant positive effect on behavior intention to use. Perceived usefulness (β=0.424, P<0.05) contributing more to intention than perceived ease of use (β=0.389 ,p< 0.05). Perceived ease of use (H_3) also had a positive effect on perceived usefulness (β=0.613,P< 0.05).

Table 2: Factor loadings

Scale Item	1	2	3	4	5	6
PU4	**.701**					
PU3	**.773**					
PU2	**.701**					
PEOU2	**.676**					
PU1	**.643**					
PEOU3	**.629**					
PEOU1	**.615**					
PEOU4	**.610**					
BI3		**.863**				
BI2		**.860.**				
BI4		**.798**				
BI1		**.758**				
FC1			**.759**			
FC3			**.750**			
FC4			**.730**			
FC2			**.677**			
FC6				**.917**		
FC5				**.763**		
FC7				**.722**		
SI2					**.657**	
SI4					**.653**	
SI3						**.839**
SI1						**.610**

Table 3: KMO and Bartlett`s Test

Kaiser – Meyer –Olkin Measure of sampling Adequacy		0.739
Bartlett`s Test of Sphericity	Approx.Chi-Square df Sig	971.290 171 .000

Therefore, the total effect of perceived ease of use on behavior intention was (β=0.636). As for the paths from the external variables to the TAM constructs, the effect of Social Influence towards the perceived usefulness (H_4) was supported. Social Influence had a positive significant effect on perceived usefulness (β=0.249, P< 0.05). The indirect effect of social influence towards behavior intention to use EIR via perceived usefulness was (β=0.540, P<0.05). Facilitating conditions (H_5) had positive effect on perceived ease of use (β=0.238, P<0.05). Indirect effect of facilitating conditions toward behavior intention to use EIR was (β=0.120). The direct effect of facilitating conditions on the behavior intention was not significant (β= -0.028, P>0.05). The effect of perceived usefulness

explained 28% of the variance of usage behavior intentions by undergraduates as well as the effect of perceived ease of use explained 18% of the variance. The effect of social influence explained 6.3% of the variance on perceived usefulness and the effect of facilitating conditions explained the 5.6% of the variance on perceived ease of use. The perceived ease of use had significant influence on perceived ease of use. It explained the 37% of the variance on perceived usefulness.

Table 4: Hypotheses testing results

Hypotheses	Path	Standardized Coefficient (β)	t- value	Results
H_1	PU ⟶ BI	0.424	5.02	Accepted P<0.05
H_2	PEOU ⟶ BI	0.389	4.51	Accepted P< 0.05
H_3	PEOU ⟶ PU	0.613	8.40	Accepted P< 0.05
H_4	SI ⟶ PU	0.249	2.79	Accepted P< 0.05
H_5	FC ⟶ PEOU	0.238	2.62	Accepted P< 0.05

The findings of this study support the appropriateness of using TAM to understanding the intention of social science undergraduates that use electronic information resources. The significant effects of both perceived usefulness and perceived ease of use on behavior intention were examined; with perceived usefulness exerting stronger influence than perceived ease of use. Some previous studies have empirically shown that perceived usefulness has stronger effect on user acceptance of an e- library or e-library systems. It is implied that the users positive beliefs about usefulness are key to their acceptance of an information system (Park et al. 2009; Lee 2010; Adwan, Adwan and Smedley 2013).This indicates that undergraduates aware of the usefulness of EIR and the benefits of using EIR for their learning and research activities.

Perceived ease of use also has significantly influenced behavioral intention to use EIR (p<0.05). Perceived ease of use has significantly influenced on perceived usefulness of EIR (p<0.05) which indicates use of EIR is less useful if they find them difficult to use. According to TAM, the direct effect of perceived ease of use on usefulness involves that increased ease of use can help improve performance by reducing the effort needed to do the same task (Kim, 2006).

Results indicate that Social Influence (SI) had positive effect on perceived usefulness. Several studies found that social influence has significant effect on usage behavior indirectly through PU (Venkatesh and Davis 2000). Karahanna and Straub (1999) also indicated that social influence affects usage indirectly via the process of internalization by reinforcing one`s belief in the usefulness of the system (Karahanna and Straub 1999). Not only indirect effect, the results showed that the social influence had direct effect on behavior intention of EIR (β= .441, p<0.05). The pressure from the university teachers and necessity of finding information might positively influence to the undergraduates.

In the present study, facilitating conditions was found to have a positive influence on user perceptions of ease of use (β= .238, P<0.05). It is an important determinant of

users' beliefs about ease of use. But the direct effect of facilitating conditions toward the behavior intention not significant (β= -.028, P>0.05). As Krimpanot(2007) pointed out that providing good facilitating conditions are independent of perceived ease of use of information system, factors such as network facilities, computer facilities and organizational support for use information system can influence perceived behavior intention of use of new information system (Krimpanot 2007). Hence, library management must pay more attention to providing good facilitating conditions to users in order to access EIR. In addition, to improving facilitating conditions for the access of EIR, adequate support to help the users' effective use, needed information will enhanced the users' behavior intentions to use EIR in future.

CONCLUSION

This study examined how user beliefs are related to user acceptance of EIR use and what are the most influential factors that can affect the user behavior. Perceived usefulness, Perceived ease of use and social influence are the most influential factors for Undergraduates behavior intention of EIR use. However, the study suggests that both key variables and external variables that have been found to affect users' behavioral intention should be considered as important factors in the process of implementing and promoting EIR for social science undergraduates. The findings of this study have implications for enhance the use of EIR. In order to improve the usage of EIR, library management must take procedures to provide good facilities to undergraduates to access EIR more efficiently. At the same time library management can also organizes user awareness and training programs for future effectiveness. However, this research has limitation because it employed social science undergraduates in one university. Therefore to generalize the results, further research is needed to investigate using other universities in Sri Lanka.

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