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Electronic library services acceptance and use
An empirical validation of unified theory of acceptance and use of technology

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Abstract

Purpose – The purpose of this study is to apply the unified theory of acceptance and use of technology (UTAUT) model in the context of electronic library services in public Jordanian universities. This study investigated the determinants of use behaviour (UB) regarding electronic library services, and the moderating effects of age, gender, experience, education level and academic discipline on the relationships between the determinants and behavioural intention (BI).

Design/methodology/approach – Quantitative data were collected, through a questionnaire instrument from a sample of 575 students. Statistical analysis of the study's model was conducted using the structural equation modelling technique.

Findings – Empirical examination of the model's hypotheses indicated that students' "intention to use" electronic library services is dependent on performance expectancy (PE), effort expectancy (EE) and social influence (SI), while students' "use behaviour" is dependent on facilitating conditions (FCs) and intention to use. The effect of PE on BI was significant for younger, undergraduate and social sciences discipline students, while EE was significant for older and applied discipline students.

Practical implications – Library directors should design promotional campaigns directed to younger, undergraduate and social academic discipline studentsto promote the efficiency of electronic libraries. Faculty members can be targeted with these promotional campaigns to exert influence on the desired effect on students' intentions toward using the electronic library. Easier-to-use technology and training courses for older and applied academic discipline students are necessary. It is important to ensure that the physical facilities and technical support provide students with needed assistance. Online help should be available.

Originality/value – This study empirically validated the UTAUT model in the context of electronic library services within an Arab culture. The study also investigated the moderating effects of students' characteristics, including age, gender and experience, in addition to education level and academic discipline, as new affects.

Keywords UTAUT, Behavioural intention, Social influence, User behaviour,
Electronic library services, Performance expectancy, Effort expectancy, Facilitating conditions

Paper type Research paper

Introduction

The rapid growth and advancement of new technologies has made tremendous improvement in and provided for many changes in communication processes, as well as reduced the cost of communication for individuals. Services rendered with the help of information technology (IT) are faster and more effective. Moreover, the increased efficiency and speed creates faith and confidence about the products and services of an

organization among its customers (Vinitha *et al.*, 2006). Electronic information sources, a relatively recent development in information and communications technology (ICT), are among the most powerful tools ever invented in human history and continue to increase in importance for the academic community (Ayele and Sreenivasarao, 2013).

Library science is one field where universities apply IT to provide library services to students electronically. The introduction of computers and other telecommunication technologies in libraries during the past quarter of the century has changed the concept of libraries and the library profession (Tibenderana *et al.*, 2010). The global trend towards the digitization of library resources helps to improve the availability and accessibility of information to users. Libraries have been transformed into digital and virtual libraries where books, journals and magazines have changed into e-books, e-journals and e-zines. Electronic resources are easily accessible in remote areas, as information seekers are no longer confined to the walls of the library (Kwak *et al.*, 2002). Activities that were previously carried out manually in libraries with so much effort are now being carried out more smoothly and effectively with the help of ICT. Library organization, administration and technical processes have become easier because of ICT, and more work can be done in a more relaxed mood (Vinitha *et al.*, 2006).

Motivated by the widespread use of the Internet and associated IT, Jordanian universities are investing considerable resources to change the traditional way they operate and to deliver services that provide better, more convenient and less costly services to their students through applying IT-enabled systems (Awwad and Al-Mohammad, 2010). However, while many resources have been devoted to developing these systems, library researchers have observed that digital libraries remain underutilized (Wood *et al.*, 1995), and if these systems are not widely utilized, then it will be difficult to obtain a corresponding return on investment (Orji *et al.*, 2010). Organizations cannot achieve any return on their investments in information systems unless the systems are actually used by their intended users (Allameh and Abbasi, 2010). Because the use of electronic library services at Jordanian universities is voluntary rather than mandatory, their use by Jordanian university students is still underutilized. The majority of students prefer to use traditional library services, rather than electronic library services. This was obvious when interviews were carried out by the researchers with a number of employees in the libraries and several students, who pointed out the low level of acceptance and use of electronic services provided by the libraries.

This study mainly adopts the unified theory of acceptance and use of technology (UTAUT) model proposed by Venkatesh *et al.* (2003). The UTAUT model has been proven to be more accurate than other models, with the ability to predict technology acceptance 70 per cent of the time (Venkatesh *et al.*, 2003), especially in developing countries (Gupta *et al.*, 2008). Therefore, the main objective of this study is to investigate UTAUT in the context of electronic library services and to identify the effect of age, gender, experience, education level and academic discipline as new moderating variables.

Theoretical background
Electronic library acceptance and use
Several terms, such as electronic library, digital library, virtual library, web library and online library, have been used synonymously to represent a similar concept which

focuses on digital content of documents (Vinitha *et al.*, 2006). There have been significant advances in the technical development of digital libraries in areas, such as information storage, information retrieval and system integration, resulting in dramatic improvements in their performance (Orji *et al.*, 2010). After a thorough review of literature related to adoption of new technology, especially e-libraries, the researchers found that several previous studies adopted the UTAUT model to investigate factors affecting the acceptance and use of e-library services (Abdul Rahman *et al.*, 2011; Ayele and Sreenivasarao, 2013; Orji, 2010; Orji *et al.*, 2010; Tibenderana *et al.*, 2010; Van Schaik, 2009).

### The unified theory of acceptance and use of technology
Based on the most significant constructs from the technology acceptance theories and models, Venkatesh *et al.* (2003) formulated a new model called the UTAUT. This model integrates four core determinants of intention and usage with up to four moderators of key relationships (Figure 1).

Study model and hypotheses development
The UTAUT model consists of six constructs and four moderators (Figure 1). The researchers modified this model in two ways. First, voluntariness is not included in the current study model as a moderating variable, given that the use of electronic library services is voluntary and not mandatory. Second, academic discipline and education level were introduced as moderating variables between behavioural intention (BI)/use behaviour (UB) and its antecedents.

Performance expectancy
Performance expectancy (PE) is defined as the degree to which an individual believes that using a system will help him or her attain gains in job performance (Venkatesh *et al.*, 2003). PE is a multi-dimensional construct and relates to individuals' perceptions of job-fit, usefulness, outcome expectations, extrinsic motivation and relative advantage in using the technology (Venkatesh *et al.*, 2003). Prior studies suggested that PE was a predictor of BI to use IT and significant in shaping an individual's intention to use new
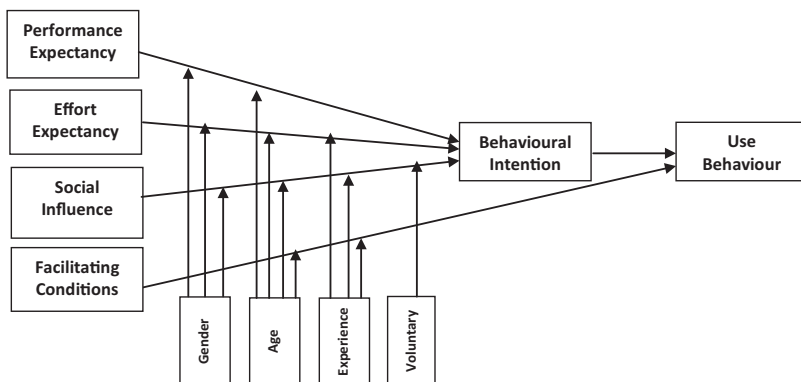
Figure 1.
UTAUT model

Source: Venkatesh *et al.*, 2003

technology (Venkatesh and Davis, 2000; Venkatesh *et al.*, 2003; Zhou *et al.*, 2010). Male users tend to be more comfortable with new information systems than females and tend to spend more time using new information systems, thus obtaining additional benefit from the systems (Venkatesh and Davis, 2000; Venkatesh *et al.*, 2003), although Yi *et al.* (2005) reported that female end users found the system to be more useful than their male counterparts. Older end users have difficulties and are uncomfortable when using information systems, and they tend to find new information systems less useful when performing their assignments (Burton-Jones and Hubona, 2005; Morris and Venkatesh, 2000; Venkatesh *et al.*, 2003). Thus, this will lead to lower PE among them where they perceived the system as not useful and cannot satisfy their job requirements. Based on the above, the following hypotheses are proposed for this study:

H1. PE has a positive direct effect on students' BI to use electronic library services.

H1a. PE has a positive indirect effect on students' UB of electronic library services through BI.

H1b. The influence of PE on BI will be moderated by gender, age, education level and academic discipline.

Effort expectancy
Effort expectancy (EE) is the extent of convenience perceived for using a system. Venkatesh *et al.* (2003) defined EE as the degree of ease associated with the use of the system. Three constructs from the existing models capture the concept of EE, namely perceived ease of use (Technology Acceptance Model 1 and 2), complexity (model of personal computer (PC) utilization) and ease of use (innovation diffusion theory). Several previous studies suggested that EE was significant in shaping an individual's BI to use new technology (Venkatesh and Davis, 2000; Venkatesh *et al.*, 2003; Zhou *et al.*, 2010) and remains one of the most critical factors that contribute to technology acceptance (Orji *et al.*, 2010). Constructs associated with EE would be stronger determinants of individuals' intention for women (Venkatesh and Morris, 2000; Venkatesh *et al.*, 2003). Female end users of new information systems, such as digital libraries, had higher levels of computer anxiety and their level of EE tended to be lower than their male counterpart (Venkatesh *et al.*, 2003). Also, women were more concerned with the ease of use of information systems and perceived a stronger ease of use compared to men (Venkatesh and Morris, 2000). Older users with different capabilities had difficulties in retrieving information from information systems, and these capabilities decreased as age increased, such that older end users struggled more to adjust to the new environment compared to younger end-users (Burton-Jones and Hubona, 2005; Morris and Venkatesh, 2000). Based on the above, the following hypotheses are proposed for this study:

H2. EE has a positive direct effect on students' BI to use electronic library services.

H2a. EE has a positive indirect effect on students' UB of electronic library services through BI.

H2b. The influence of EE on BI will be moderated by gender, age, experience, education level and academic discipline.

Social influence

Venkatesh *et al.* (2003) defined social influence (SI) as the degree to which an individual perceives how important others believe is it that he/she should use the technology. Three constructs have been used in previous models to measure SI:

(1) subjective norm (theory of reasoned action, Technology Acceptance Model 2 theory of planned behaviour and combined technology acceptance model and theory of planned behaviour);

(2) social factors (model of PC utilization); and

(3) image (innovation diffusion theory).

SI reflects on the effect of referees' opinions on individual user behaviour (Zhou, 2011). According to SI theory, users tended to comply with other important referees' opinions (Bagozzi and Lee, 2002). SI assumes that an individual's behaviour is influenced by those around them and how others will view their use of the new technology. Women tended to be more sensitive to others' opinions, and therefore, SI was found to be more salient when forming an intention to use new technology (Venkatesh *et al.*, 2003). Older users were more inclined to experience more difficulty in processing new or complex information, thus affecting their learning of new technologies, and this difficulty may be attributed to the increasing cognitive and physical limitations associated with age (Morris *et al.*, 2005). Hence, older workers attach more importance to receiving help and assistance on the job. Individuals, during the early use of a new technology, seemed to be more strongly influenced by social factors than later on during sustained usage (Venkatesh *et al.*, 2003). Based on the above, the following hypotheses are proposed for this study:

H3. SI has a positive direct effect on students' BI to use electronic library services.

H3a. SI has a positive indirect effect on students' UB of electronic library services through BI.

H3b. The influence of SI on BI will be moderated by gender, age, experience, education level and academic discipline.

Facilitating conditions

Venkatesh *et al.* (2003) defined facilitating conditions (FCs) as the degree to which an individual believed that an organizational and technical infrastructure existed to support technology use. Three constructs from the existing models capture the concept of FCs (Ajzen, 1991; Venkatesh *et al.*, 2003):

(1) perceived behavioural control (theory of planned behaviour/decomposed theory of planned behaviour and combined technology acceptance model and theory of planned behaviour);

(2) FCs (model of PC utilization); and

(3) compatibility (innovation diffusion theory).

Venkatesh *et al.* (2003) identified empirically that BI and FCs were two direct determinants of adoption behaviour. FCs, such as training and support provided, affected technology use directly based on the idea that in an organizational environment, FCs can serve as the proxy for actual behavioural control and influence

behaviour directly (Ajzen, 1991). Several studies have found that the FCs construct positively impacted actual use directly (Al-Gahtani *et al.*, 2007; Chang *et al.*, 2007; Venkatesh *et al.*, 2003) or through BI (Taylor and Todd, 1995). As people get older, they are more likely to be influenced by others. Older workers are more likely to place increased salience on SIs, with the effect declining with experience (Morris and Venkatesh, 2000). The effect of FCs on UB is expected to increase with experience as users of technology find multiple avenues for help and support throughout the organization (Venkatesh *et al.*, 2003). Based on the above, the following hypotheses are proposed for this study:

H4. FCs have a positive direct effect on students' UB of electronic library services.

H4a. The influence of FCs on usage will be moderated by age, experience, education level and academic discipline.

BI and UB
A positive BI was found to be essential in the actual usage of technology (Chen *et al.*, 2008). Consistent with all models drawing from psychological theories, which argue that individual behaviour is predictable and influenced by individual intention, UTAUT contended and proved BI to have significant influence on technology usage (Venkatesh *et al.*, 2003; Venkatesh and Zhang, 2010). Intention to use refers to the strength of a library user's intensity of desire to use digital information resources for his/her study or research; hence, the intention to use played an important role in predicting future usage of digital libraries (Abdul Rahman *et al.*, 2011). There is substantial empirical evidence that supports the causal relationship between BI and UB (Venkatesh and Davis, 2000; Venkatesh and Morris, 2000). Thus, the following hypothesis is proposed for this study (Figure 2):

H5. BI has a positive direct effect on students' UB of electronic library services.

Research methodology
Sampling design and data collection
The target population selected for this study is the students studying at public Jordanian universities. The total number of students studying at these universities is
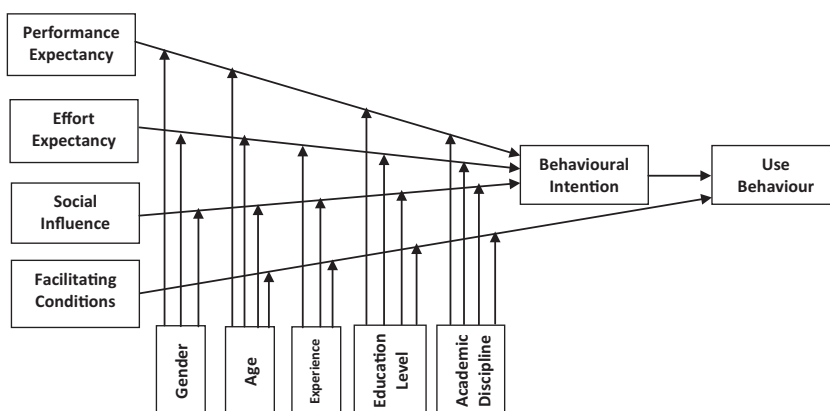

Figure 2.
Study model

201,495, according to the 2011/2012 annual statistical report published by the Jordanian Ministry of Higher Education and Scientific Research (MOHE, 2013). It would be too expensive and impractical to use all of the population in this study; therefore, the study population is limited to the four largest public universities in Jordan, namely: University of Jordan, Yarmouk University, University of Mutah and Hashemite University. The total number of students at these 4 universities was 118,576 in 2011/2012, which accounts for 59 per cent of all students in all public universities in Jordan. The sample unit is individuals studying at these 4 Jordanian universities. Because of the large size of the study population, time and cost constraints and the lack of a sampling frame, a convenience sample was chosen as a sampling method.

Data were collected using a questionnaire survey (Appendix). Students were contacted in the university libraries. The decision to address students in the library was deemed more insightful, as those students can base their evaluations and responses upon their immediate experiences with electronic library services. A total of 700 copies were distributed during the first semester of the 2013/2014 academic year. In all, 590 questionnaires were returned, but only 575 students provided valid survey responses, which represents an 82 per cent response rate. This number of questionnaires is consistent with guidelines presented by Comrey and Lee (1992), who pointed out that the sample size of 50 as very poor, 100 as poor, 200 as fair, 300 as good, 500 as very good and 1,000 as excellent. The high response rate was attributed to the fact that the researchers disseminated and collected the questionnaires in the library.

Constructs measurement
Measures of all the constructs in the UTAUT model were adopted from previous studies (Foon and Fah, 2011; Gefen *et al.*, 2003; Sripalawat *et al.*, 2011; Venkatesh *et al.*, 2003; Venkatesh and Davis 2000; Venkatesh and Zhang, 2010; Wu *et al.*, 2012). The study survey consisted of two sections. The first section related to gender, faculty, education level, age and experience, while the second section related to UTAUT model constructs: PE, effort expectancy (EE), social influence (SI), facilitating conditions (FC), behavioural intention (BI) and use behaviour (UB). Table I presents the UTAUT model constructs and their operational definitions. The items were modified and rephrased to suit the special context of electronic library services. The constructs of the research model are defined according to items proposed by Venkatesh *et al.* (2003). Statements used to measure model constructs are shown in Appendix.

Instrument reliability and validity
The reliability of the questionnaire was measured using Cronbach's alpha coefficient. The reliability of each construct has alpha indexes greater than the suggested value (0.70), which is considered acceptable and indicates that the questionnaire was developed with good internal consistency (Hair *et al.*, 2010). Another alternate measurement of reliability is composite reliability (CR) proposed by Werts *et al.* (1974). The scale is considered reliable when composite reliability is greater than 0.70 (Hair *et al.*, 2010). The confirmatory factor analysis (CFA) shows that all constructs exceed the recommended level for composite reliability measures (Table II).

Construct validity includes convergent validity and discriminate validity (Gefen *et al.*, 2000). Discriminate validity is shown when maximum shared variance (MSV) and average shared variance (ASV) is less than the average variance extracted (AVE). All

Construct	Operational definition
Performance expectancy	The degree of belief by a student to get help in improving task performance (access to information) by using electronic library services
Effort expectancy	The degree of usability feeling by a student while he/she is using electronic library services to access needed information
Social influence	The perception degree of a student that an important person near him/her believes that he/she should use electronic library services to access needed information
Facilitating conditions	The degree of belief by a student that there's an organizational or technological basis to support his/her use of electronic library services provided by library staff
Behavioural intention	The student's intention of continuous and regular use of electronic library services in future to access needed information
Use behaviour	A student's actual frequency of electronic library services use to access needed information

Table I.
UTAUT model
constructs definition

constructs met this criterion (Table II), which provides additional support for discriminate validity (Hair *et al.*, 2010). Convergent validity was examined using the average variance extracted measure. For all constructs, the values of AVE were all higher than the recommended minimum of 0.50 (Table II), indicating high convergent validity (Hair *et al.*, 2010).

Model fit
Hair *et al.* (2010) suggested a set of fit indices used to examine the structural model. As shown in Table III, all of the model fit indices exceed the respective common acceptance levels suggested by previous studies, demonstrating that the model exhibits a good fit with the data collected. Thus, the researchers could proceed to examine the path coefficients of the structural model.

Data analysis and findings
Students' characteristics
A detailed descriptive statistics of students' characteristics are shown in Table IV. The results indicate the percentage of male (44.2 per cent) and female (55.8 per cent) respondents. Social science students make up the largest percentage (61.2 per cent), with 38.8 per cent from applied sciences. Undergraduate students represent the largest percentage (64.9 per cent). More than half the students (54.6 per cent) were between 18-22 years old. Nearly 42 per cent (41.4 per cent) have been using a computer for more than 5 years.

Predictive power of model
As shown in Table II, the model can explain 35 per cent of the variance in BI ($R^2 = 0.35$) and 25 per cent of the variance in UB ($R^2 = 0.25$). Thus, the resulting R^2 underlines the fact that BI and UB could be influenced by other factors in addition to those in the model. The structural model results are shown in Figure 3.

Construct	Loadings	AVE	CR	MSV	ASV	Alpha	R^2
Performance expectancy (PE)							
PE1	0.80	0.64	0.88	0.35	0.21	0.86	
PE2	0.86						
PE3	0.79						
PE4	0.75						
Effort expectancy (EE)							
EE1	0.77	0.61	0.86	0.35	0.23	0.88	
EE2	0.80						
EE3	0.82						
EE4	0.74						
Social influence (SI)							
SI1	0.87	0.71	0.91	0.21	0.15	0.91	
SI2	0.85						
SI3	0.85						
SI4	0.81						
Facilitating conditions (FC)							
FC1	0.83	0.63	0.84	0.36	0.24	0.84	
FC2	0.76						
FC3	0.79						
Behavioural intention (BI)							
BI1	0.80	0.65	0.85	0.36	0.22	0.84	0.35
BI2	0.77						
BI3	0.83						
Use behaviour (UB)							
UB1	0.88	0.81	0.93	0.22	0.17	0.93	0.25
UB2	0.92						
UB3	0.89						

Table II.
Results for
confirmatory factor
analysis (CFA) *

Notes: * AVR: average variance extracted; CR: composite reliability; MSV: maximum shared variance; ASV: average shared variance

Fit indices	Threshold	Value
CMIN ($\chi 2$)/DF	<3	1.912
GFI (goodness of fit index)	>0.9	0.948
RMSEA (root mean square error of approximation)	<0.05	0.040
RMR (root mean square residual)	<0.08	0.059
NFI (normed fit index)	>0.90	0.955
CFI (comparative fit index)	>0.90	0.978
RFI (relative fit index)	>0.90	0.947

Table III.
Goodness-of-fit
indices for structural
model

Characteristic	Frequency	(%)
Gender		
Male	254	44.2
Female	321	55.8
Academic discipline		
Applied sciences	223	38.8
Social sciences	352	61.2
Education level		
Undergraduate	373	64.9
Graduate	202	35.1
Age		
18-22 years	314	54.6
23-27 years	142	24.7
28-32 years	68	11.8
33 years and more	51	8.9
Experience		
1-2 years	136	23.7
3-4 years	201	35.0
5 years and more	238	41.4

Table IV.
Sample
characteristics
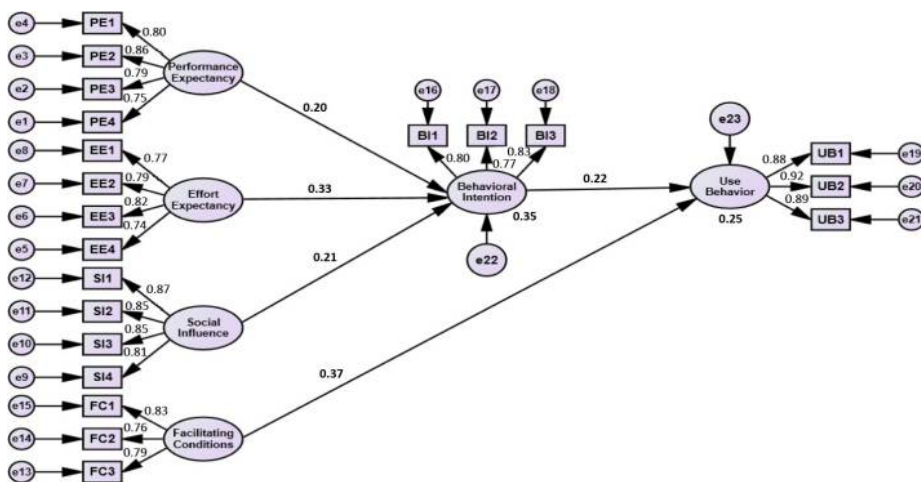
Figure 3.
Structural model
results

Hypotheses testing
This study uses a structural equation modelling (SEM) approach to develop a model that
represents the causal relationships among the study variables using AMOS 20.0. Table V
and Figure 3 represent the results of testing the structural links of the study model.
Multi-group structural equation within AMOS was used to assess the moderating effects on
the structural model. For each of the moderation tests, the data set was split into two
sub-groups. Age was divided into two groups (22 years or less and 23 years or more).

Hypotheses				β	t-value
Direct path					
H1	Performance expectancy	$\rightarrow$	Behavioural intention	0.20	3.53***
H2	Effort expectancy	$\rightarrow$	Behavioural intention	0.33	5.53***
H3	Social influence	$\rightarrow$	Behavioural intention	0.21	4.38***
H4	Facilitating conditions	$\rightarrow$	Use behaviour	0.37	7.46***
H5	Behavioural intention	$\rightarrow$	Use behaviour	0.22	4.17***
Indirect path					
H1a	Performance expectancy	$\rightarrow$	Use behaviour	0.05	2.65**
H2a	Effort expectancy	$\rightarrow$	Use behaviour	0.07	3.27**
H3a	Social influence	$\rightarrow$	Use behaviour	0.05	2.71**

Table V.
Direct and indirect effects of independent variables

Notes: *t-value greater than 1.96 ($p < 0.05$); **t-value greater than 2.58, ($p < 0.01$); ***t-value greater than 3.29 ($p < 0.001$); β: path coefficients

Experience was divided into two groups (4 years or less and 5 years or more). To examine the effect of the difference in moderators' groups on the relationship between the determinants and BI/UB, the researchers conducted two multi-sample tests. In each of the two analyses, one path coefficient was constrained to be equal across the two groups for each moderator. Using the chi-square (χ^2) difference test, the resulting model fit was then compared to a base model in which all path coefficients were freely estimated. Table VI represents the results of testing the moderating effect.

Performance expectancy
H1 was supported, as the statistical result indicates that there is a direct significant effect of PE on students' BI to use electronic library services ($\beta = 0.20$; $t = 3.53$; $p < 0.001$). H1a was supported, as the statistical result indicates that BI mediates the effect of PE on students' use of electronic library services ($\beta = 0.05$; $t = 2.65$; $p < 0.01$).

H1b, which predicted that gender, age, education level and academic discipline will moderate the effect of PE on BI, was partially supported as the differences between groups of age ($\Delta\chi^2 = 4.30$; $p < 0.05$), education level ($\Delta\chi^2 = 3.21$; $p < 0.10$) and academic discipline ($\Delta\chi^2 = 10.11$; $p < 0.01$) were significant, but the differences between groups of gender ($\Delta\chi^2 = 0.29$; $p > 0.10$) were not. In other words, age has a significant effect on the relationship between PE and BI for younger students ($\beta_{22 \text{ and less}} = 0.47$, $t = 3.99$), but not for older students ($\beta_{23 \text{ and more}} = 0.14$, $t = 1.30$). Education level has a significant effect on the relationship between PE and BI for undergraduate students ($\beta_{\text{undergrad}} = 0.41$, $t = 3.77$), but not for graduate students ($\beta_{\text{grad}} = 0.13$, $t = 1.09$). Academic discipline has a significant effect on the relationship between PE and BI for students from social disciplines ($\beta_{\text{social}} = 0.52$, $t = 4.89$), but not for students from the applied disciplines ($\beta_{\text{applied}} = -0.00$, $t = -.012$). As for the gender, both groups (male and female) pay equal attention to PE ($\beta_{\text{Male}} = 0.24$, $t = 2.27$; $\beta_{\text{Female}} = 0.33$, $t = 2.62$).

Effort expectancy
H2 was supported, as statistical results indicate that there is a direct significant effect of EE on students' BI to use electronic library services ($\beta = 0.33$; $t = 5.53$; $p < 0.001$). H2a

Gender

Model fit: *CMIN/DF = 1.532; GFI = 0.922; NFI = 0.930; RFI = 0.917; CFI = 0.974; RMSEA = 0.030*

Path			Male β	t	Female β	t	$\Delta\chi^2$
H1b Performance expectancy	$\rightarrow$	Behavioural intention	0.24	2.27**	0.33	2.62**	0.29
H2b Effort expectancy	$\rightarrow$	Behavioural intention	0.49	4.43***	0.30	3.41***	1.67
H3b Social influence	$\rightarrow$	Behavioural intention	0.18	2.65**	0.19	4.00***	0.04

Age

CMIN/DF = 1.531; GFI = 0.920; NFI = 0.930; RFI = 0.917; CFI = 0.974; RMSEA = 0.030

Path			22 or less β	t	23 or more β	t	$\Delta\chi^2$
H1b Performance expectancy	$\rightarrow$	Behavioural intention	0.47	3.99***	0.14	1.30	4.30**
H2b Effort expectancy	$\rightarrow$	Behavioural intention	0.22	2.27*	0.54	5.37***	5.08**
H3b Social influence	$\rightarrow$	Behavioural intention	0.20	3.76***	0.15	2.73**	0.38
H4a Facilitating conditions	$\rightarrow$	Use behaviour	0.45	5.31***	0.58	5.32***	0.73

Experience

CMIN/DF = 1.476; GFI = 0.923; NFI = 0.932; RFI = 0.920; CFI = 0.977; RMSEA = 0.029

Path			4 or less β	t	5 or more β	t	$\Delta\chi^2$
H2b Effort expectancy	$\rightarrow$	Behavioural intention	0.33	3.95***	0.46	3.82***	0.67
H3b Social influence	$\rightarrow$	Behavioural intention	0.17	3.55***	0.19	2.99**	0.05
H4a Facilitating conditions	$\rightarrow$	Use behaviour	0.42	4.94***	0.60	5.63***	1.29

Education level

CMIN/DF = 1.599; GFI = 0.917; NFI = 0.927; RFI = 0.914; CFI = 0.971; RMSEA = 0.032

Path			Undergraduate β	t	Graduate β	t	$\Delta\chi^2$
H1b Performance expectancy	$\rightarrow$	Behavioural intention	0.41	3.77***	0.13	1.09	3.21*
H2b Effort expectancy	$\rightarrow$	Behavioural intention	0.29	3.14**	0.53	4.87***	2.70
H3b Social influence	$\rightarrow$	Behavioural intention	0.18	3.73***	0.18	2.78**	0.00
H4a Facilitating conditions	$\rightarrow$	Use behaviour	0.50	6.09***	0.52	4.63***	0.02

Academic discipline

CMIN/DF = 1.621; GFI = 0.915; NFI = 0.926; RFI = 0.912; CFI = 0.970; RMSEA = 0.033

Path			Applied β	t	Social β	t	$\Delta\chi^2$
H1b Performance expectancy	$\rightarrow$	Behavioural intention	-0.00	-0.012	0.52	4.89***	10.11***
H2b Effort expectancy	$\rightarrow$	Behavioural intention	0.61	5.06***	0.23	2.73**	6.62***
H3b Social influence	$\rightarrow$	Behavioural intention	0.19	2.91**	0.17	3.56***	0.04
H4a Facilitating conditions	$\rightarrow$	Use behaviour	0.51	4.79***	0.47	5.67***	0.08

Notes: *t-value greater than 1.96 ($p < 0.05$); **t-value greater than 2.58, ($p < 0.01$); ***t-value greater than 3.29 ($p < 0.001$); β: path coefficient; t: t-value; p: significance level

Table VI.
Moderating effect results

was supported, as statistical results indicate that BI mediates the effect of EE on students' UB of electronic library services ($\beta = 0.07$; $t = 3.27$; $p < 0.01$).

H2b, which predicted that gender, age, experience, education level and academic discipline will moderate the effect of EE on BI, was partially supported as only the differences between groups of age ($\Delta\chi^2 = 5.08$; $p < 0.05$) and academic discipline ($\Delta\chi^2 = 6.62$; $p < 0.01$) were significant, but the differences between groups of gender

($\Delta\chi^2 = 1.67; p > 0.10$), experience ($\Delta\chi^2 = 0.67; p > 0.10$) and education level ($\Delta\chi^2 = 2.70; p > 0.10$) were not. In other words, age has a significant effect on the relationship between EE and BI for older students ($\beta_{23\text{ and more}} = 0.54, t = 5.37$) and low significant effect for younger students ($\beta_{22\text{ and less}} = 0.22, t = 2.27$). Academic discipline has a significant effect on the relationship between EE and BI for students from applied disciplines ($\beta_{\text{applied}} = 0.61, t = 5.06$) and low significant effect for students from social disciplines ($\beta_{\text{social}} = 0.23, t = 2.73$). As for the gender groups ($\beta_{\text{Male}} = 0.49, t = 4.43$; $\beta_{\text{Female}} = 0.30, t = 3.41$), experience groups ($\beta_{4\text{ and less}} = 0.33, t = 3.95$; $\beta_{5\text{ and more}} = 0.46$, $t = 3.82$) and education level groups ($\beta_{\text{undergrad}} = 0.29, t = 3.14$; $\beta_{\text{grad}} = 0.53, t = 4.87$), they pay equal attention to EE.

Social influence
H3 was supported, as statistical results indicate that there is a direct significant effect of SI on students' BI to use electronic library services ($\beta = 0.21; t = 4.38; p < 0.001$). *H3a* was also supported, as statistical results indicate that BI mediate the effect of SI on students' UB of electronic library services ($\beta = 0.05; t = 2.71; p < 0.01$).

H3b, which predicted that gender, age, experience, education level and academic discipline will moderate the effect of SI on BI, was not supported where the differences between groups of gender ($\Delta\chi^2 = 0.04; p > 0.10$), age ($\Delta\chi^2 = 0.38; p > 0.10$), experience ($\Delta\chi^2 = 0.05; p > 0.10$), education level ($\Delta\chi^2 = 0.00; p > 0.10$) and academic discipline ($\Delta\chi^2 = 0.04; p > 0.10$) were not significant. This means that gender groups ($\beta_{\text{Male}} = 0.18$, $t = 2.65; \beta_{\text{Female}} = 0.19, t = 4.00$), age groups ($\beta_{22\text{ or less}} = 0.20, t = 3.76; \beta_{23\text{ or more}} = 0.15$, $t = 2.73$), experience groups ($\beta_{4\text{ and less}} = 0.17, t = 3.55; \beta_{5\text{ and more}} = 0.19, t = 2.99$), education level groups ($\beta_{\text{undergrad}} = 0.18, t = 3.73; \beta_{\text{grad}} = 0.18, t = 2.78$) and academic discipline groups ($\beta_{\text{applied}} = 0.19, t = 2.91; \beta_{\text{social}} = 0.17, t = 3.56$) pay equal attention to SI.

FCs
H4 was supported, as statistical results indicate that there is a direct significant effect of FCs on students' UB of electronic library services ($\beta = 0.37; t = 7.46; p < 0.001$). *H4a*, which predicted that age, experience, education level and academic discipline will moderate the effect of FCs on UB, was not supported where the differences between groups of age ($\Delta\chi^2 = 0.73; p > 0.10$), experience ($\Delta\chi^2 = 1.29; p > 0.10$), education level ($\Delta\chi^2 = 0.02; p > 0.10$) and academic discipline ($\Delta\chi^2 = 0.08; p > 0.10$) were not significant. This means that age groups ($\beta_{22\text{ or less}} = 0.45, t = 5.31; \beta_{23\text{ or more}} = 0.58, t = 5.32$), experience groups ($\beta_{4\text{ and less}} = 0.42, t = 4.94; \beta_{5\text{ and more}} = 0.60, t = 5.63$), education level groups ($\beta_{\text{undergrad}} = 0.50, t = 6.09; \beta_{\text{grad}} = 0.52, t = 4.63$) and academic discipline groups ($\beta_{\text{applied}} = 0.51, t = 4.79; \beta_{\text{social}} = 0.47, t = 5.67$) pay equal attention to FCs.

Behavioural intention
H5 was supported, as statistical results indicate that there is a direct significant effect of BI on students' actual use of electronic library services ($\beta = 0.22; t = 4.17; p < 0.001$) (Figure 4).

Discussion and recommendations
This study empirically validated the UTAUT in the context of electronic library services. The findings of this study offer several important implications for research and practice. PE had a significant effect on students' intention to use electronic library
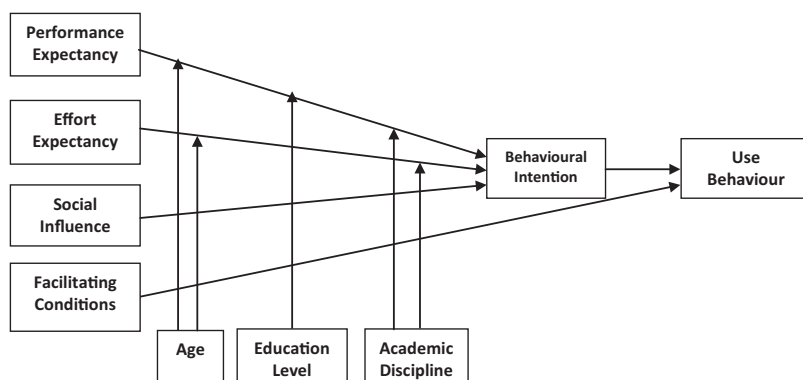
Figure 4.
Resultant model

services, which implied that students who acknowledged the advantages and benefits of library services and feel that using electronic library services improves their performance would be more intentional and more motivated to use those services, where the ability of the system to assist users to achieve tasks quickly will motivate users to adopt the system (Taiwo and Downe, 2013). Therefore, as the students understand the functionality, features and usefulness of the electronic library services to their duties and assignments, their PE will increase and their likelihood to adopt them will increase. This result is consistent with previous studies (Abu-Al-Aish and Love, 2013; Alwahaishi and Snášel, 2013; Chong *et al.*, 2011; Lee *et al.*, 2012; Orji *et al.*, 2010; Pardamean and Susanto, 2012; Venkatesh *et al.*, 2003; Venkatesh and Davis, 2000; Wang *et al.*, 2009; Wu *et al.*, 2012). The effect of PE on BI is highly significant for younger, undergraduate and social sciences discipline students. This means that younger and undergraduate students who are studying at social sciences faculties are more concerned about efficiency of use. This result is partially consistent with Venkatesh *et al.* (2003), who suggested that the effect of PE will be stronger for younger men.

Among the determinants of BI, EE had the strongest effect on students' BI. This implies that students who perceived the ease of use of electronic libraries would have a higher intention to use it than those with a lower level of perceived ease of use. A complex system or a web interface that is difficult to navigate can make users uninterested in adopting the system or website (Byun and Finnie, 2011). This result is consistent with several previous studies (Abu-Al-Aish and Love, 2013; Al-Awadhi and Morris, 2008; Al-Shafi and Weerakkody, 2010; Chang *et al.*, 2007; Chong *et al.*, 2011; Gupta *et al.*, 2008; Liu *et al.*, 2010; Orji *et al.*, 2010; Sargent *et al.*, 2012; Venkatesh *et al.*, 2003; Venkatesh and Davis, 2000; Wang *et al.*, 2009). The effect of EE on BI is highly significant for older and applied sciences discipline students. In other words, older and applied sciences discipline students are highly concerned about ease of use. This result is partially consistent with Venkatesh *et al.* (2003), who suggested that the effect of EE will be stronger for older men.

SI is a significant antecedent of BI in the context of electronic library services. Students will tend to use electronic library services if his/her important opinion leaders use electronic library services. An encouragement by important opinion leaders to use the system can motivate users to adopt the information system (Taiwo *et al.*, 2012). End users might not be obliged to use the system until they are motivated by important opinion leaders who can

influence their attitude and behaviour (Taiwo and Downe, 2013). This result is consistent with several previous studies (Al-Awadhi and Morris, 2008; Al-Shafi and Weerakkody, 2010; Alwahaishi and Snášel, 2013; Morris and Venkatesh, 2000; Orji et al., 2010; Pardamean and Susanto, 2012; Sripalawat et al., 2011; Venkatesh et al., 2003). The effect of SI on BI was strong for all students regardless of their gender, age, experience, education level and academic discipline. In other words, all students pay high equal attention to the opinions of other people who are important to them.

FCs were found to have a significant positive influence on UB. This means that students will tend to use electronic library resources if they perceive that they are able to gain access to the necessary resources, knowledge, information and the required support to utilize electronic library services. If users do not own these resources and knowledge, then they may not continue to use the system (Zhou, 2011). This result is consistent with several previous studies (Foon and Fah, 2011; Sargent et al., 2012; Taylor and Todd, 1995; Venkatesh et al., 2003; Venkatesh et al., 2011; Venkatesh and Davis, 2000). The effect of FCs on UB was strong for all students regardless of their gender, age, experience, education level and academic discipline. This means that all students pay high equal attention to facilities and technological support provided by library stuff.

Interestingly, students' gender and experience were not significant moderators in the UTAUT model. Thus, these two variables were dropped from the model. This result is inconsistent with Venkatesh et al. (2003), who suggested that the PE will be stronger for men, EE and SI will be stronger for non-experienced women and FCs will be stronger for experienced students. This result is not surprising if one takes into consideration the change in gender roles, as females have become a real partner and a strong competitor for males in Jordan in all fields, and they strive to prove themselves and to defend this position. Also, both groups of students, regardless of the expertise they possessed, need technical support (modern, efficient and fast equipment) and organizational support (conditions of use in terms of time, place and other facilities) in dealing with electronic library services. The ease of use of electronic library services constitutes an obsession for both expert and non-expert students, because it includes the use of local and global renewable databases which may require following certain procedures each time. Expert students need to maintain their image with other people who are important to them, and non-expert students need to improve their current image.

Implications

Service providers need to develop applications and content which are held by users as inestimable, ensuring the capacity of the instrument to keep up with and improve users' expeditious lifestyles (Alkhunaizan and Love, 2012). As the results indicate, the most important reason behind the reluctance of students to use electronic library services by Jordanian universities students is the lack of organizational or technological basis to support the use of electronic library services (FCs). To overcome this impediment, library directors should provide the required support (organizational and technological) to students to encourage them to use electronic library services. This can be undertaken through several actions directed primarily to all students. These actions could be as follows:

- Directors of electronic libraries should emphasize the presence of specialized personnel to provide technical support to provide students with instant assistance and also to obtain up-to-date software and hardware facilities.

- More attention should be focused on the location and design of the library building in terms of an appropriate location of the library on the university campus which should be highly accessible, provide proper lighting, open spaces to move freely, provide a sufficient number of computers and a quiet and comfortable atmosphere.
- More attention should be given to physical facilities (utilities), for example, resting places, bathrooms, escalators, photocopying and printing services. These actions will make electronic library services readily available to students.

The second important reason behind the reluctance of students to use electronic library services is the lack of a "usefulness" feeling by a student while he/she is using an electronic library service to access needed information (EE). To overcome this barrier, electronic library directors should enhance the usefulness feelings of students while they are using electronic library services to encourage them to use them. This can be undertaken through several actions directed primarily towards older and applied academic discipline students and to somewhat younger and social academic discipline students. These actions include the following:

- Developers of technology and software should provide simple and easy-to-use technology. Because students may have an intensified course load and they do not have enough time to spend at a library, it is necessary to seek ways to decrease the procedures required to obtain needed information.
- Computer literacy among students can affect their perception of the ease of the system; thus, it is necessary to hold training courses for students on how to use electronic library services.
- The study plan for students should include elective and compulsory courses which include training students on the use of electronic library resources.

The third important reason behind the reluctance of students to use electronic library services is lacking the belief or thinking to align with others (opinion leaders) or to align with normative standards (SI). To overcome this barrier, electronic library directors should take advantage of SIs in promoting the use of electronic library services. This can be initiated through several actions directed to all students. These actions could be as follows:

- Directors of electronic libraries should promote electronic library services to potential early adopter students (outstanding, excellent students) who have a higher level of personal innovation in IT than other students. Once those outstanding students become familiar with electronic library services, they may persuade their colleagues and friends to adopt the system.
- Faculty members can be targeted in this promotional campaign to exert the desired effect on students' intentions towards electronic library services because they are influential groups on students. They may arrange regular visits to a library with students to encourage them to use electronic library services.

The fourth important reason behind disinclined students to use electronic library services is the lack of awareness of the benefits offered by the library (PE). To overcome this barrier, electronic library directors should enhance students' beliefs about the benefits offered by the electronic library resources and how these benefits help in

improving task performance (access to information). This can be done through several concentrated actions and directed fundamentally towards younger undergraduates and social academic discipline students. These actions could be as follows:

- Designing a promotional campaign directed at all students, involving university administration, library directors and faculty members, to promote electronic library services as helping students to access up-to-date information quickly and efficiently.

- Designing contests among students to create a spirit of competition, thereby striving to win. These competitions are based on collecting certain information or performing certain tasks using the Internet.

- Asking students to perform certain assignments which require the use of the Internet, which will drive them to use the services of the electronic library and recognize its benefits.

Limitations and future research

As in all research, this study has some limitations. The research was carried out in a university environment and may not reflect the acceptance of electronic library services outside the university; therefore, future research should be conducted with a larger number of participants and in another environment to confirm the results shown in this study. Venkatesh *et al.* (2003) proposed that there should be three measuring times of the same groups of samples applied to provide a longitudinal study. This study took a single-time approach (cross-sectional) which is different from the UTAUT model. Future research should be conducted with a longitudinal study. As the current study was conducted in Jordan, which has a unique culture, the findings may not apply to countries that have different cultures. Future research conducted across differing cultures will make the results more generalizable. Because this study only examines the acceptance of electronic library services using a convenience sample of students in Jordanian governmental universities, the results may not be generalized to other academic institutions, such as private universities, as culture can differ across universities. Future research should consider a more representative sample to include all potential users of electronic library services.

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Appendix: Questionnaire items

(1) Performance expectancy:

- *PE1*: I think that the use of electronic library services gives better results in the search.

- *PE2*: I think that the use of electronic library services improves my performance in the search.

- *PE3*: I think that the use of electronic library services accelerates my performance in the search.

- *PE4*: I think that the use of electronic library services can be beneficial in the search.

(2) Effort expectancy:

- *EE1*: The use of electronic library services would probably be easy to use.
- *EE2*: The use of electronic library services should be easy for me.
- *EE3*: The use of electronic library services should facilitate the searching process.
- *EE4*: The use of electronic library services is understandable.

(3) Social influence:

- *SI1*: People who are important to me think that I should use electronic library services.
- *SI2*: People who affect my learning think that I should use electronic library services.
- *SI3*: I expect to use electronic library services because people around me do.
- *SI4*: Not using electronic library services is falling behind others.

(4) Facilitating conditions:

- *FC1*: I feel the need to use electronic library services to advance my search abilities.
- *FC2*: I have the knowledge to take advantage of electronic library services.
- *FC3*: Electronic library services are suitable to the way I like to do things.

(5) Behavioural intention:

- *BI1*: I intend to use electronic library services in the future.
- *BI2*: I would use electronic library services to assess my abilities.
- *BI3*: I plan to use electronic library services within the next semester(s).

(6) Use behaviour:

- *UB1*: I have used electronic library services to identify my level in search.
- *UB2*: I have used electronic library services to assess my abilities.
- *UB3*: I have used an e-placement test to prove my abilities.

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