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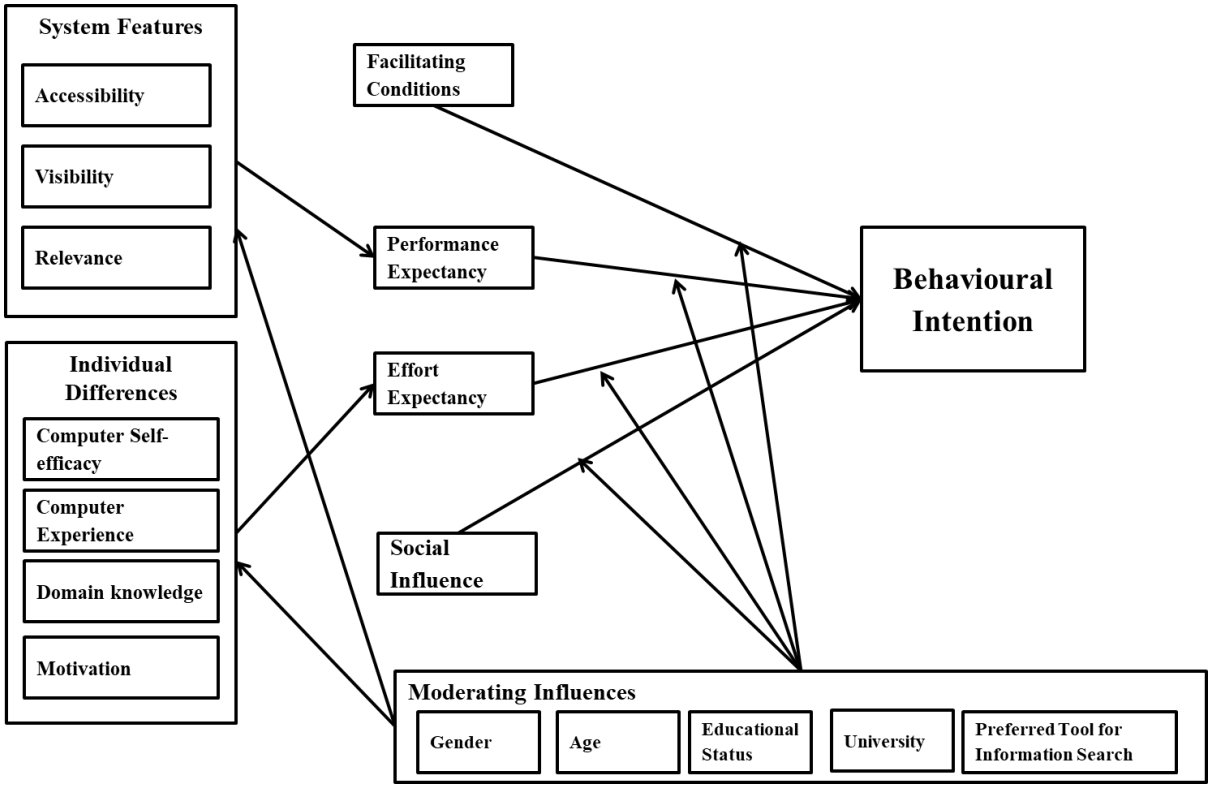

Figure 1: The Study's Research Model

Constructs	No. of items	Cronbach's Alpha
Domain Knowledge	4	.77
Computer Experience	4	.65
Relevance	5	.64
Accessibility	5	.91
Visibility	3	.88
Computer Self-Efficacy	5	.78
Effort Expectancy	4	.84
Motivation	6	.80
Facilitating Conditions	6	.90
Social Influence	6	.82
Performance Expectancy	5	.87
Behavioural Intention	4	.78

Table 1: Cronbach's Alpha for Students' Perceived Use of Google Scholar and ULW

Construct	Sub-Construct	Item	Standardised loadings	AVE	CR	Alpha
Individual Differences	Computer Experience	CS3	0.605	0.405	0.646	0.654
		CS1	0.855			
		CS4	0.345			
	Motivation	MO4	0.568	0.524	0.842	0.803
		MO3	0.655			
		MO2	0.620			
		MO1	0.897			
		MO5	0.823			
	Domain Knowledge	DK3	0.877	0.757	0.925	0.778
		DK2	0.875			
		DK1	0.919			
		DK4	0.805			
	Computer Self Efficacy	SE5	0.657	0.504	0.834	0.786
		SE4	0.595			
		SE3	0.767			
		SE2	0.706			
		SE1	0.804			
System Features	Accessibility	AC1	0.899	0.681	0.914	0.913
		AC2	0.762			
		AC3	0.870			
		AC4	0.705			
		AC5	0.874			
	Visibility	VI1	0.846	0.711	0.881	0.880
		VI2	0.833			
		VI3	0.851			
	Relevance	RE1	0.500	0.519	0.750	0.680
		RE2	0.615			
		RE5	0.964			

Table 1. Standardised item loadings, AVE, CR, and Alpha Values

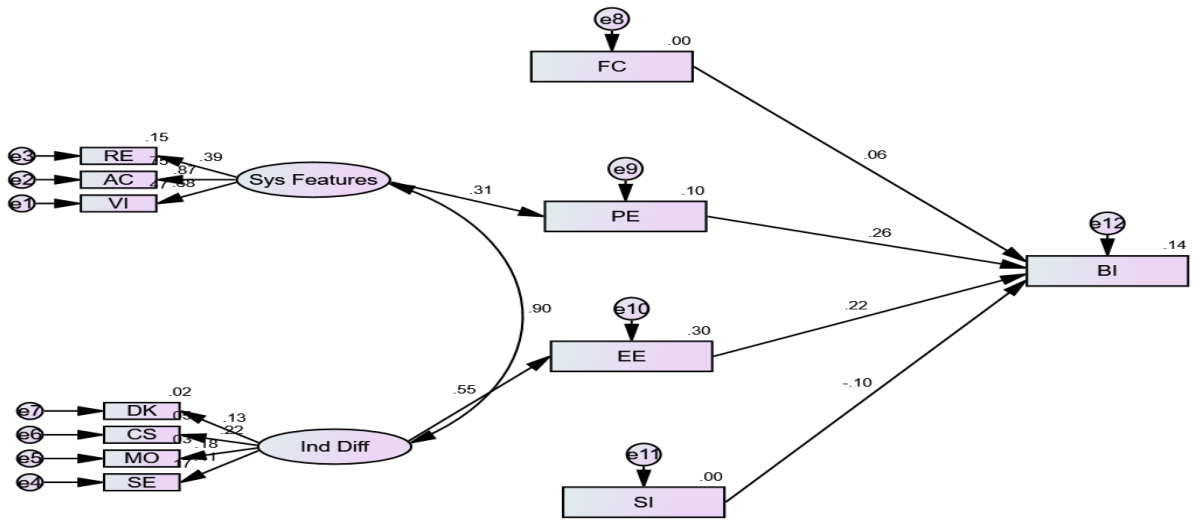

Figure 2. Structural Equation Model using AMOS

Model Fit Indices	**χ^2 /df**	**NFI**	**RFI**	**IFI**	**TLI**	**CFI**	**RMSE**
Guideline Values	< 5	> 0.90	> 0.90	> 0.90	> 0.90	> 0.90	< 0.08
Value	4.476	0.906	0.873	0.869	0.924	0.854	0.032

Table 2. Model Fit Indices *(Note：χ^2/df is the ratio between Chi-square and degrees of freedom, NFI is the Normed Fit Index, RFI is the Relative Fit Index, IFI is the Incremental Fit Index, TLI is the Tucker Lewis Index, CFI is the Comparative Fit Index, and RMSEA is Root Mean Square Error of Approximation)*

			Estimate	S.E.	C.R.	P
PE	<---	System Features	.311	.113	3.921	***
EE	<---	Individual Differences	.551	.270	4.285	***
VI	<---	System Features	.684			
AC	<---	System Features	.867	.166	7.898	***
RE	<---	System Features	.386	.076	4.818	***
SE	<---	Individual Differences	.412			
MO	<---	Individual Differences	.176	.202	1.974	.048
CS	<---	Individual Differences	.216	.162	2.358	.018
DK	<---	Individual Differences	.134	.185	1.545	.122
BI	<---	Facilitating Conditions	.063	.044	.963	.336
BI	<---	Performance Expectancy	.257	.049	3.878	***
BI	<---	Effort Expectancy	.216	.062	3.249	.001
BI	<---	Social Influence	-.098	.042	-1.493	.135

Table 3. Standardised Regression Weights

Hypothesis	Hypothesis Statement	Status
H1	Performance Expectancy directly influences students' Behavioural Intention	Accepted
H2	Effort Expectancy directly influences students' Behavioural Intention	Accepted
H3	Social Influence directly influences students' Behavioural Intention	Rejected
H4	Facilitating Conditions directly influence students' Behavioural Intention	Rejected
H5	System Features directly influence students' Performance Expectancy	Accepted
H6	Individual Differences directly influence students' Effort Expectancy	Accepted

Table 4. Hypotheses Status

Introduction

Google Scholar, a search engine to support scholarly research, came into use over a decade ago and was promoted early on by university libraries as one of many potential finding aids and as part of the 'scholar's toolkit'. Google Scholar, along with other developments in library systems to provide access to the world's information, without doubt has signalled the end of the university library as perceived as a place constrained by its four walls. By the time it arrived on the information landscape, the ubiquity of Google had already been established with studies of its use, for example in Brophy and Bawden (2005) and Fast and Campbell (2004) suggesting it was preferred by students, along with calls to make the library catalogue 'like Google', based largely on the perceived ease of the keyword searching it enabled. As such, the impact that the search engine has had on the practice of the provision of the e-library and its services is the subject of many papers (for example, Fagan, 2014). However, the impact of this technology in the university e-library, in particular in terms of its role and services, is equally of interest when understood from the perspective of the university student, the user. This paper presents the findings of a PhD study that sought to determine how university students perceive one of the tools made available to them from a university e-library, Google Scholar (GS). In exploring students' view of this search engine, and specifically the potential determinants of their behaviour (intended use of the search engine) the investigation seeks to offer the university library practical propositions regarding its role in promoting GS among its university students. In other words, this study aims to answer the question, '*do university students accept or adopt GS as a useful tool in finding scholarly information and what are the factors that influence this acceptance and ultimately predict use'*. By focusing on understanding how GS is perceived, the aim is to draw attention to determinants of user behaviour and in doing so offer insights into how the university library might best promote and facilitate students' effective use of GS in the context of the e-library.

Given the specific aim, this paper reports on postgraduate students' intention to use Google Scholar in the context of their research studies. The study focuses on the views of international postgraduates studying in the UK, as part of a larger study on their use of library digital resources whilst studying overseas. The study chose postgraduate students, in general, as the focus as their information needs are more advanced and complex than those of undergraduate students (Catalano, 2013). The scrutiny was directed towards international postgraduate students, in particular, since they constitute a considerable proportion of the student population in the UK (OECD, 2018), the UK being a popular destination for international students (Marginson, 2018). Moreover, the UK's Council for International Student Affairs ([UKCISA], 2019), reports that nearly two-fifths (19%) of the students undertaking postgraduate programmes in the country were international students indicating that this was a population that merited consideration.

An explanation for technology use and the theory on which the investigation is based is that of Venkatesh *et al*.,'s (2003) Unified Theory of Acceptance and Use of

Technology (UTAUT). This model consolidates previous theories (such as Davis' Technology Acceptance Model (TAM), Davis, 1989) to explain people's adoption of technology and provides insight into the factors influencing behavioural intention. In particular, the theory enables research to explore beyond the prevailing reported influences of ease of use, efficiency and convenience, and draws fairly heavily on the context of the user, such as the influence of factors such as their self-efficacy, a belief in one's ability to carry out a task. For this reason, and as explained above, the study focuses on the fairly narrow user group, of international postgraduate students. In this paper, the approach taken to the user survey is outlined and the findings analysed to suggest the main factors that appear to influence the student's perception and intended use of Google Scholar. In addition, we discuss how this study and its findings offers further insights into the role of the university library in providing and facilitating use in context of the e-library and its services.

Background

Electronic (E-Libraries) or Digital Libraries in the University Context

Information and communication technologies (ICT) have become an essential constituent of traditional and distance systems of education (Hrtoňová *et al*., 2015; Nirban and Chasul, 2014). Consequently the electronic (e-library) or digital library, has become an integral part of the educational context to provide convenient access to research and academic resources through the course of a student's academic existence (Hwee and Yew, 2018). The functions of an e-library are similar to its traditional counterpart and include searching, locating and copying, requisitioning and obtaining e-books and e-journals (Park *et al*., 2009; Sheeja, 2010). Nevertheless, they have significant advantages over traditional libraries including the ease with which digital resources can be monitored and accessed, and with the provision to use search engines to search for necessary resources (Hwee and Yew, 2018). In the university context, an e-library could be understood to be an academic or university library website. Liu (2008) stated that an academic library website offers access to "online catalogs, electronic databases, subject resources, library instruction/tutorials, and digital collections" (p. 6) and where through this centralisation the effort required by users in locating information is reduced and moreover, where the "changing needs" of users can be supported as the development of ideas, learning, and capabilities are cultivated (p. 14.). The academic library website becomes the centre for the "dissemination of digital information; the portal to a multitude of e-resources and e-services; the main gateway for virtual users; and a marketing tool allowing libraries to project their image" (Al-Qallaf and Ridha, 2018, p. 1).

Google Scholar in the University Library

Jacsó (2005) chronicles the recent history of the Google Scholar search engine from its inception in November 2004 and, whilst he critiques it with regard to content omissions, the conclusion reached was that, with future development, Google Scholar will become an excellent free tool for scholarly information discovery and retrieval. Subsequent analysis of

the advantages and disadvantages have criticised its incomplete index and regulated vocabulary shortfall (Cathcart and Roberts, 2005) whilst others have lauded its links to the full text URL, when available, from locations such as university repositories (Lercher, 2008). The number of available scholarly documents on the internet has been projected by Khabsa and Giles (2014) to be at least 114 million (in the English language) and of which at least 100 million are accessible using Google Scholar and 27 million available freely. More recently, in 2018, it has been estimated that the size of GS is approximately 398 million documents (Gusenbauer, 2019) which however, keeps growing as GS indexes material on the Internet. The key to its success is often attributed to its capability to link full-text articles directly, to recover interdisciplinary results and to search articles from repositories and open access journals (Hartman and Mullen, 2008; Neuhaus *et al.*, 2008) and, as such, it is not surprising that GS has been promoted by various libraries as a replacement to subscription databases (Arendt, 2013). Only 8 months after its release, Hartman and Mullen in 2006 reported that GS was listed on the alphabetical list of vetted scholarly database and indexes in 73 libraries out of 113 university members of the Association of Research Libraries, and Neuhaus *et al.,* in 2008, reports that 73% of US universities and colleges in the United States provide GS mediated link resolution from GS records to licensed full text library resources. Furthermore, about third to a half of all institutions were using a Google powered campus site search engine which advertises GS to all who search the academic website. Whilst web search engines, such as Google, have caused much debate within the field of library and information science, Jamali and Asadi (2010) report that academics (students, faculty members, and research staff) in their study preferred to utilise web search engines such as Google. Studies such as these might suggest that GS is in competition with database vendors, publishers and libraries but rather it is used and indeed promoted at institutional level as a discovery tool for finding information.

Use and adoption of Google Scholar

The use and adoption of various search tools by students in Higher Education explores the user perspective. The popularity of Google Scholar with academics (Ollé and Borrego, 2010) and students (Cothran, 2011) may be attributed to its keyword search using Google's ranked retrieval and its search feature 'cited by' which allows the searcher to trace related articles for a published paper. Tella *et al.,* (2017) survey of postgraduate students of the University of Ilorin, Nigeria reported that their views were based mostly on its broad subject coverage and often links to the full text. Studies of intention to use technology, based on the Technology Acceptance Model (TAM), further investigate the constructs of a person's perception of technology (such as perceived usefulness and perceived ease of use). In the context of earlier concerns that digital libraries were not used as frequently as they could be Hong *et al.*, (2002) explored perceived ease of use and perceived usefulness and identified that, for digital library technology, both were impacted by organisational environment. In exploring this further, the role played by 'self-efficacy'(Bandura, 1999), a belief in one's capacity to act to achieve one's goals, has been investigated as extending the potential determinants of students' use of

the digital library technology (and search engines). As a result there appears to be a current generation of university students who have a familiarity with technology, and possibly a dependency, to the extent that they are often perceived as confident in their ability and 'self-efficacy' to find the information they need and to do so unaided by a library service or librarian as intermediary (Mi and Nesta, 2006). Research has recognised the potential role played by self-efficacy and studies such as that of Ramayah and Aafaqi (2004) have found there is a direct impact from self-efficacy on perceived ease of use and perceived usefulness. With regards specifically to Google Scholar it is possible that further individual factors contribute to a perceived benefit in using GS, for example Cothran (2011) survey of 1,114 graduate students enrolled at the University of Minnesota and reported a 'sense of loyalty' as an influence.

Measuring student perception of Google Scholar

The previous discussion has suggested it is possible to identify and model the key influences, in particular the constructs of people's perceptions of the usefulness and ease of use of technology in its 'use context'. In the context of the postgraduate university library user seeking scholarly information, we propose that extensions to TAM with its key determinants of perceived usefulness and ease of use are necessary to identify and attempt to understand further contextual determinants and their possible influence on the acceptance and use of GS. Therefore the aim is to explore both the *task orientated* influences of perceived usefulness and ease of use, as well as the user perception of possible *contextual* influences. To this end, Venkatesh *et al*'s (2003) proposed Unified Theory of Acceptance and Use of Technology (UTAUT) is utilised. Gruzd *et al.,* (2012) suggest that UTAUT is now most frequently used in studies investigating the reasons why people choose to adopt or choose to reject an information technology. The model was established after the testing of the eight previous technology acceptance theories: the theory of reasoned action, the motivational model, the technology acceptance model, the theory of planned behaviour, the combined TAM and TPB, innovation diffusion theory, social cognitive theory, and the model of PC utilisation. The outcome was a consolidation of the influencing factors reflecting people's goal-orientated social and psychological motivations and identified four key constructs (or independent variables) of Effort Expectancy (EE), Performance Expectancy (PE), Facilitating Conditions (FC), and Social Influence (SI) as direct determinants of acceptance of a technology (Venkatesh et al., 2003). The popularity of the UTAUT is evident as insights can be drawn from its application in different contexts. For example, Yang and Lee (2007) utilised the UTAUT framework and found that in Korea, adoption of information technologies is impacted significantly by Social Influence and Performance Expectancy; interestingly, they reported that this is not the case in the USA, leading to speculation that the differing factors relating to culture and values may be influencing technology acceptance. The impact of contextual factors, such as culture or attitudes to knowledge sharing has been explored in regards to the use of technologies in contexts ranging from e-government to mobile learning (for example, in Baptista and Oliveria 2015, Al-Hujran *et al*., 2015, Hoque

and Bao,2015*)*. Use of the UTAUT framework in the context of postgraduate student perception of GS therefore is based on the four constructs or independent variables PE, EE, SI and FC of technology use.

Method

Measurement development

The four constructs of UTAUT as detailed below and a set of measurement statements drawn up for each, form the questionnaire that was distributed to the study participants. Additionally, as suggested in the literature, sets of statements were included that could provide a measure on a Likert scale of Self-Efficacy (SE), Domain Knowledge (DK), Computer Experience (CS), Motivation (MO), and further Visibility (VI), Accessibility (AC) and Relevance (RE). A five-point Likert scale, representing responses of 'strongly disagree' to 'strongly agree' respectively, was utilised in the questionnaire. This scale was chosen as we wanted to use factor analysis to combine the responses to the statements and generate a composite score for each. The validity of these statements as indicators of each of the factors was confirmed in factor analysis and were further grouped as relating to either individual (internal) context influences (SE, DK, CD, MO) or external system influences (VI, AC, RE). The relationships held amongst all of the factors in the questionnaire (PE, EE, SI, FC, SE, DK, CS, MO, VI, AC, RE) were explored to understand each as influencing the students' perception (with respect to intended use) of Google Scholar. Each factor is detailed as follows.

Performance and Effort 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) and concerns how informative, useful, meaningful and significant and helpful the information service is for the user (Dwivedi *et al.,* 2016). Effort Expectancy (EE) defined in Venkatesh as *'the degree of ease associated with the use of the system*' and further concerns the extent of convenience perceived for using a system. In the context of students' e-library services acceptance (Awwad and Al-Majali, 2015) both PE and EE are considered to be task oriented and non-emotional perceived gains from use and may promote user's behavioural intention. In this study it is proposed that the perceptions of PE, perceived benefits gained from use, and EE, perceived usable and effortless in seeking scholarly information, influence the postgraduate students' intention to use Google Scholar. The following statements relating to PE and EE were adapted from Venkatesh et al. (2003) and Awwad and Al-Majali (2015) and included in the questionnaire as:

- PE1 Enables me to improve my study performance
- PE2 Enables me to achieve study/research task
- PE3 Helps me accomplish my study more quickly

- PE4 Increases my productivity
- PE5 Be beneficial to my study
- EE1 It is easy for me to become more skillful in using it
- EE2 I will continue to find it easy to use
- EE3 Learning to use it does not require much effort
- EE4 My interaction with it will continue to be clear and understandable

Social Influence and Facilitating Conditions

Social influence (SI) has been defined as '*the degree to which an individual perceives that important others believe he or she should use the new system'* (Venkatesh *et al.,* 2003, p.451) and in the regards to postgraduate student use of GS, previous studies of e-library use suggest that SI may have strong and direct influence on behaviour intention. For example, Cothran's (2011) study involving undergraduate students found SI of the peer group and student tutors were a key influencing factor motivating use. Further, Cothran's*,* (2011) suggested loyalty as a factor and found that people's use of Google for searching the web have reported the influence of others and perceived popularity of the engine to be a key determining factor (Oh and Colón-Aguirre, 2019). Facilitating conditions (FC) are defined by Venkatesh *et al.,* (2003) as '*the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of a system'* (p.453). This is interesting as GS may be offered as one of many resources available from the university library as recommended and promoted for searching for journal articles and conference papers, alternatively it can accessed directly via the URL scholar.google.co.uk. In this study it is presupposed that SI and FC would influence the postgraduate students' intention to use the library resources hosted or promoted by the university library, of which Google Scholar is one. Statements relating to SI were adapted from Awwad and Al-Majali (2015) and FC from Jeong (2011) and included in the questionnaire as:

- SI1 People whose opinions I value prefer that I use it
- SI2 People who are important to me at my university think that I should use it
- SI3 People who influence my study think I should use it
- SI4 I am encouraged to use it by people who assess my work
- SI5 I use it because people around me do
- SI6 Not using it makes me feel I am falling behind others
- FC1 It is suitable for the way I study
- FC2 I can get help when I have difficulty
- FC3 The help can direct me to the information I need
- FC4 The help supports me in my tasks/research study
- FC5 Other students show me how to use it
- FC6 I have been trained to use it

Extensions to Unified Theory

We believe further contextual factors influence student use of GS, such as and in particular the self-efficacy of the postgraduate student. Venkatesh *et al*. (2012) also explored factors influencing undergraduate student use and added the factor Motivation defined as '*the fun or*

pleasure derived from using a technology'. Hedonic motivation is unlikely to have particular influence as a determinant of the postgraduate students' adoption and use of GS, however the contextual factor such as self-efficacy might. It is important to extend the model to focus on context and aspects of that may impact on shaping behaviour. For example, in the context of searching for scholarly information Umukoro and Tiamiyu (2017) found that student use of the e-library was predicted on the basis of certain service factors including self-efficacy. Furthermore they found that the factors inhibiting the use of the e-library included lack of awareness and absence of training. Jeong (2011) added Self-Efficacy (SE) defined as *An individual's perceptions of his or her ability to use computers to accomplish a task'*, and Sumayyah and Patel (2012) added Domain Knowledge (DK) '*The person's knowledge of a particular discipline, domain, or area that is relevant to the search*; Computer experience (CS) '*The amount and type of computer skills a person acquires over time'* and Motivation (MO). Informed by previous studies of factors influencing digital library use, such as Hong *et al.,* (2002) and Park *et al*., (2009) further factors were identified relating to facilitating conditions of the system and its perceived Visibility (VI), defined as '*The degree to which a system is observable or apparent in an organization*' (Thong *et al.,* 2002), its Accessibility (AC) defined as *'The degree of convenience with which an individual accesses an information system'* (Park *et al.,* 2009) and its Relevance (RE) '*The degree to which the system matches tasks as carried out in the current environment'* (Thong *et al.,* 2002*)*. The following statements were adapted from Park *et al*., (2009) for the factors SE and AC, from Thong *et al.,* (2002) for VI and RE, from Abdullah *et al.,* (2016) for the factors DK and CS, and from Sumayyah and Patel (2012) for Motivation (MO).

VI1 People at my university know that it exists	SE1 I feel confident in my ability to use it	RE1 It has resources that relate to my area of interest.
VI3 People know where to look to find it.	SE2 can use it even if there is no one around me to show me	RE2 It has enough resources for my study.
VI3 I find that it is always available	SE3 I don't need a lot of time to complete my task using it	*RE3 It provides current information in my area of interest.*
AC1 I find it easy to navigate.	SE4 I often find it difficult to use it for my studies	*RE4 It is a very efficient study tool.*
AC2 I am able to use it whenever I need it.	SE5 Helps even when the task is challenging	RE5 It is limited in its coverage of my area of interest.
AC3 I find it easy to get access to.		
AC4 It is easily accessible.		
AC5 I can locate the resources I need.		

MO1 Helps me achieve in my studies.	DK1: I am familiar with the subject domain that I search for	CS1 I am confident in using computers
MO2 Really encourages me in developing my areas of interest	DK2 I have previous experience searching in this subject domain.	*CS2 I think I am efficient in the use of a computer to complete my task*

MO3 I feel I am working within a community of scholars in my area.	DK3 I have previous experience searching in this subject domain	CS3 I can use a computer even if there is no one around to show me
MO4 Helps even when the task is challenging.	DK4 I have the domain knowledge that it necessary to search for what I want to find	CS4 I am happier if there is someone around to ask for help
MO5 I don't always feel in control of the outcome.		

Predicted Model

Figure 1 presents the conceptual model and hypothesised relationships of this study where PE, EE, SI, FC influence BI. In this way, it is predicted that when postgraduate students perceive that PE, EE, SI and FC are fulfilled, then behavioural (continuance) intention may be promoted. Behaviour Intention is considered as an individual's intention to use a particular technology that directly affects actual usage. The modelling of the factors enables further exploration of the influence between the types of factors, that is of the task focus of PE and EE and of the social and organisation infrastructures (particularly the university library context) of SI and FC that may influence use. Furthermore it is hypothesised that in the postgraduate student use context, the factors added Computer Experience (CE), Domain Knowledge (DK) and Self-Efficacy (SE) are expected to have a strong influence with perceived Effort Expectancy (EE) influencing use, and further that perception of system Accessibility (AC), Visibility (VI), and Relevance (REL) are expected to have a strong influence with students' perceived Performance Expectancy (PE) and thus intention to use.

<<< INSERT Figure 1: The Study's Conceptual Model >>>

Content Analysis

A second version of the questionnaire was also created which included an open-ended question to ask the participants for the reason for their preference for Google Scholar as a search tool to use. The content analysis of the responses to the open-ended question was undertaken in stages, using hybrid coding which is a combination of deductive and inductive coding (Fereday and Muir-Cochrane, 2006). The system of coding was developed gradually and collaboratively as were the categories and themes subsequently derived from the coding. The codes developed corresponded to the reasons provided by the students for their choice to use Google Scholar. That is, *what could precisely and definitely identify their reasons for using Google Scholar*?

Sample and data collection

The questionnaire was distributed to 200 international postgraduate students studying across academic disciplines but in a single UK city namely, Manchester. The postgraduate students were recruited through convenience sampling technique and based on their availability and

accessibility on the university campuses (Ghauri and Gronhaug, 2005). The target n=200 was not a calculated representative sample size required for generalisation of the results, rather the target number provided a data set which could be questioned uisng factor analysis based on the conceptual model. There were 118 male students and 82 female students (59% and 41%, respectively). Further, the majority 70% (n=141) fell into the age group of 24-30, followed by 19% (n=38) aged 31-40, with 6.5% (n=13) from the 41 or older age group and 4% (n=8) from the under 23 age group. The majority of the students 86.5% (n = 173) were master's students, while 13.5% (n =27) were doctoral students. The questionnaires asked the respondent to write a brief description on their current research and then posed the question "*thinking about your use of Google Scholar in respect to your current postgraduate research*." Respondents were asked to respond on a Likert Scale 1-5 (strongly disagree to strongly agree) to each of the statements related to the influencing factors and to their intention to use Google Scholar. Out of the 200 participants, 20 students received the version of the questionnaire containing the single open-ended question. This was based on the general rule of thumb give in Connelly, (2008) that responses to this additional question, from 10% of the actual study sample (n = 200) would be representative.

Reliability of the Questionnaire

The reliability of the questionnaires utilised in the study were analysed using Cronbach's alpha (Ritchie and Lewis, 2003). All items that exhibited Cronbach's value of >0.5 were classified as acceptable in the present study (Hinton *et al.*, 2014). The Cronbach's alpha coefficients were found to range from 0.64 to 0.91, and were above 0.5 and mostly above the sometimes cited value of >0.7. Overall, the items in the questionnaires utilised in the study were found to be acceptable for use (Table 1).

*<<< **INSERT** Table 1. Cronbach's Alpha for Students' Perceived Use of Google Scholar and ULW >>>*

Results

Analysis was performed using Confirmatory Factor Analysis (CFA) to assess the reliability and validity of the contextual influencing individual factors of SE, DK, CE, MO and system factors VI, AC, RE and then a second stage to the analysis was based on Structural Equation Modelling to examine the relationship held amongst all the constructs in the predicted model.

The item loadings ranged from 0.345 to 0.964, with 19 out of the 28 items having loadings greater than 0.7, which is considered to the minimal value for construct validity. A few items were dropped from the constructs Relevance (RE) and Computer Experience (CS). The AVE (average variance extracted) exceeds the minimal value 0.5 for 6 of the 7 sub-constructs that is, except Computer Experience where the AVE is 0.405. Similarly, the CR (Composite

Reliability) exceeds 0.7 for 6 out of the 7 sub-constructs except Computer Experience where the CR is 0.646. This indicates that the scale has reasonably good validity (Fornell and Larcker, 1981) as the majority of the constructs have values of AVE and CR which are greater than those recommended.

<<< INSERT Table 2. Standardised item loadings, AVE, CR, and Alpha Values >>>

Following this, Structural Equation Modelling (SEM) was utilised to estimate the structural model (Figure 2). Behavioural Intention (BI) was considered to be the chief construct that denotes the intention of students to utilise Google Scholar. Hence, this construct was considered to be the model's main endogenous factor. Effort Expectancy (EE), Performance Expectancy (PE), Facilitating Conditions (FC), and Social Influence (SI) were regarded as the exogenous variables whose influence on BI is examined through the model. Individual Differences (ID) and System Features (SF) are included to scrutinise their impact on EE and PE respectively. The statistical package AMOS (v21.0) was utilised for the model development.

*<<< **INSERT** Figure 2. Structural Equation Model using AMOS >>>*

The model fit (Table 3) report the indices of the scales obtained for the structural model. The CMIN / DF of 4.476 indicates that the model is a good fit since the value is within the guideline value (<5). The values of CFI (.854), NFI (.906), RFI (.873), IFI (.869), and TLI (.924) are close to 0.9 indicating the goodness of fit of the model.

*<<< **INSERT** Table 3. Model Fit Indices >>> (Note : χ^2/df is the ratio between Chi-square and degrees of freedom, NFI is the Normed Fit Index, RFI is the Relative Fit Index, IFI is the Incremental Fit Index, TLI is the Tucker Lewis Index, CFI is the Comparative Fit Index, and RMSEA is Root Mean Square Error of Approximation)*

The examination of the SEM (Figure 2) and (Table 4) reveal that Performance Expectancy (PE) is found to significantly influence students' Behavioural Intention with 0.257 as the standardised estimate (β coefficient) ($p<0.05$). Moreover, Effort Expectancy (EE) significantly influences students' Behavioural Intention with 0.216 as the standardised estimate (β coefficient) ($p<0.05$). However, Social Influence (SI) does not significantly

influence students' Behavioural Intention with -0.098 as the standardised estimate (β coefficient) ($p>0.05$). Again, Facilitating Conditions (FC) does not significantly influence students' Behavioural Intention with 0.063 as the standardised estimate (β coefficient) ($p>0.05$). Nevertheless, System Features significantly influences students' Performance Expectancy with 0.311 as the standardised estimate (β coefficient) ($p<0.05$). Moreover, Individual Differences significantly influences students' Effort Expectancy with 0.551 as the standardised estimate (β coefficient) ($p<0.05$). The hypothesis statements are recast as accepted or rejected accordingly (Table 5).

*<<< **INSERT** Table 4. Standardised Regression Weights >>>*

<<< INSERT** Table 5. Hypotheses Status **>>>

Discussion

The model of postgraduate student perception of Google Scholar, with regards to intention to use, in this study is based on perceived Performance Expectancy and Effort Expectancy. These were defined in Ventakesh *et al., (*2003) as task orientated and non-emotional perceived gains as in '*the degree to which an individual believes that using a system will help him or her attain gains in job performance'* and *'the degree of ease associated with the use of the system'*. In the context of international postgraduate students, the contextual (specifically social and organisation) factors of Social Influence and Facilitating Conditions did not appear to strongly influence the behaviour intention to use. Again Ventakesh *et al., (*2003) defines these factors as '*the degree to which an individual perceives that important others believe he or she should use the new system'* and *the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of a system'*. It is interesting to consider the context of the previous research where both were influencing factors in the resulting model. These such as Yang and Gui (2014), Yang and Lee (2007) and Moorthy *et al.,* (2018) were undertaken in the undergraduate student context and /or with respect to intention to use the e-library service or digital library rather than specifically Google Scholar. With regards to the resulting model in this study postgraduate participants appear to perceive Performance and Effort Expectancy as stronger determinants of use, and certainly over the social and organisational influences of their peers and by the perception of the university's facilitating use in its provision of the search tool in the e-library. This would concur with the findings of previous studies such as Oh and Colón-Aguirre (2019) and Cothran (2011) highlight the task orientation of the factors influencing use of GS. The influence of the perception of the task performance and effort is further explored with the inclusion, in this study, of the 'Individual' factors, SE, DK, CE and MO, and of the 'System' factors of VI, AC, RE. The resulting model suggests that these contextual factors of Individual and System had influence on performance and effort expectancy respectively and

with Self-Efficacy (SE) having the strongest influence as an Individual factor and Visibility (VI), Accessibility (AC) and Relevance (RE) influencing the System factor. This suggests that performance expectancy influencing use of GS in the postgraduate context is based on their perception of the visibility, accessibility and relevance of the system, and that effort expectancy also influencing use is based on their perceived self-efficacy. In sum, we might say that this appears to reflect the competency of the postgraduate student as an independent researcher and expressing a preference for the search tool that they perceive themselves as competent to use for the effective search for information relating to their area of study.

This model of the perception held may be elaborated from a further analysis of the open-ended question included in the survey. This final question asked the respondents for their reason, in their own words, for their preference for Google Scholar as a search tool to use in the context of their study. It should be noted that this question was only included in 10% (n=20) of the total questionnaires distributed as the intention was to provide a check and explore the possibility that further factors may be influence the perception of GS, but were not included in the questionnaire. The responses gathered were analysed to identify the types of reasons given and were coded as Spectrum (31%), Search Facility (30%), Availability (14%), Accessibility (11%), Accuracy (9%) and References (5%). Availability, Accessibility and Accuracy aligned to an extent with the statements in the questionnaire, especially the system features 'Accessibility' and 'Visibility' and provided insight into reasons for the students' preference for using Google Scholar according to these features and in their own words. For example comments coded as pertaining to 'Availability' expressed a preference for Google Scholar, for example '*because it is widespread and known'* and '*because some library resources need to pay to download*'. The comments relating to 'Accessibility' indicated a preference for Google Scholar because it is 'e*asy and fast to search, without the need to login*'. The reasons given for preference relating to 'Accuracy' were that Google Scholar was reported to be '[*...] efficient'*, '*convenient*', and '*precise*'. The largest category coded 'Spectrum' related to statements that mentioned subject coverage for their reason for preferring GS. For example, it was stated *I would use Google Scholar since it has a wide range of sources in all fields,* and others would seem to agree saying, *I will use Google Scholar because it enables me to get all information [...] I am looking for,* and more specifically explaining that it has *More references and journal articles in my areas of study*. This category 'Spectrum' is interesting as it has the most responses and which align to the statements in the questionnaire in the System Relevance factor, for example ' *It has resources that relate to my area of interest', ' It has enough resources for my study'*, and the negative item '*It is limited in its coverage in my area of interest*'. The students in this study appear to hold the belief that they can get everything they need from a search in GS, although a different type of user study would be necessary to understand what happens in practice, for example whilst this perception may influence intention to use, in practice another source may well be queried, such as Web of Science or Scopus. Both Accessibility and Relevance were factors influencing perceived performance expectancy and intention to use. In the participants' own words, a picture of GS is obtained as perceived as widely available and

accessible, and as relevant providing access to all the information they might need in their area of study. Finally it is interesting to identify and consider that codes that did not align to a factor in the questionnaire, namely Search Facility and References in providing further insight into the use of GS. Search Facility was the second highest proportion category with comments referring its search facilities, *'Another reason is that there is a citation link at the bottom'* and '*Finding key references*' '. And to its use for finding citations, for example: '*I used Google Scholar in finding the references*'. The specific mention of one of GS features of providing citations is not unique to GS, but is clearly something that the postgraduate student is going to find useful in the course of their research. As is the search feature specifically mentioned in the responses, '*cited by'* which allows the searcher to trace related articles for a published paper. Both mention of citations and the cited by search feature again suggests a competent user who perceives GS as a tool that will enable them to find the information they need and, it might be supposed, a user who is not influenced so much by the social and organisational factors of their peers and the university library.

Implications for research and for practice

The findings from this study highlight the distinction of the task orientated factors (of perceived performance and effort expectancy) and the social and/or organisational/infrastructure inlfuences and, to the best of our knowledge, no other study has focused on making this distinction and in the context of university student use of Google Scholar. Given that this study focused only on postgraduate students, it would be of further interest to explore these influencing factors amongst undergraduates and with differing levels of subject knowledge and research competencyFurthermore, and from this study, research might usefully investigate the individual context of the student user focusing on the core influencing factors identified here, in particular self-efficacy and perceived system accessibility and relevance. Are these core influencing factors held by undergraduate as well as postgraduate students, and consistently across academic subject domains? Furthermore could the postgraduate's perception of expected performance based on self-efficacy and perceived system accessibility and relevance further explain why social and/or organisational factors may not have an influence in their particular context? The intended aim of this study of postgraduate student user perceptions of Google Scholar was however to provide direct impact with respect to the useful insights it provides librarians and practical implications yielded on how to best promote new information resources to graduate students. Specifically, librarians may want to explore modifications to their university library websites so as to enhance users' perceptions of their usefulness and ease of use. Moreover, usability evaluation of library websites could be undertaken to enhance their acceptance by users. Also, library website designers could work to integrate Google Scholar into the websites as it appears that this would provide a familiar and comfortable interface for users to get acclimatised to the website following which they may be more receptive to investigating the other functions, features, and facilities of these websites. Overall, the perception of performance expectancy of GS and student's self efficacy with regards to its use reflects on the responsibility of the

university and academics to continue to teach students, that with some training, the influence they can have on the effectiveness of a search, why they might use different resources and to encourage critical judgement of "when" the results of a search satisfies a need.**Conclusions and further research**

The study developed and implemented a dimensional questionnaire comprising eleven factors for the purpose of exploring the perceptions determining use of the search tool (Google Scholar) by a homogenous group (international postgraduate students studying in the UK). The analysis of the data collected from the use of the questionnaire has provided insight into the influence of perceived self-efficacy and perceived system accessibility and relevance on the task related performance and effort expectancy influencing use. This approach taken provides a far more detailed picture into the complicated factors that appear to influence use of the tools and services that support students' study and research. Most importantly it enables understanding to go beyond the assumption that ease of use and convenience are the main drivers behind the decision to use. It is evident from this study that in the postgraduate context and use of a search engine, self-efficacy, one's belief in ability to use the search engine to find information) and system relevance, (one's belief that sought information can be found using the search engine) have an impact on perceived performance and effort expectancy and intention to use. Further research is recommended to explore this beyond the limitations from focusing on the narrow study group of international postgraduate students. A larger and wider groups would enable further exploration of the possible distinct model of the influencing task oriented and social/organisational factors, for example involving students with differing levels of subject knowledge and research competency. For example, given the core influencing factors identified here, in particular self-efficacy and perceived system relevance it is interesting to speculate that the undergraduate student may simply not have the domain knowledge and experience to be confident in making this assessment of performance expectancy of Google Scholar. Evidence of this would warrant the important role of the university library in its provision of reliable and trusted information resources and search tools, as well as in their teaching of critical search skills. Furthermore the rejection of the hypothesis, that contextual factors of social influence and facilitating conditions would influence use, suggests further research of interest, In particular, it would be insightful to investigate these factors as influencing use of systems other than Google Scholar, for example to explore student use of the university library website and for example Web of Science offered from therein. Again such further research could provide insightful indicators of the influence of the library within the university as a 'social' and 'facilitating' service, serving its user communities and partly driving students' intention to use A core aim of the university library is to promote and support student use in a range of online libraries and search tools, suchmeasures of impact would further the development of these services. This, and further, research based on user perceptions of the search tools and their use is therefore recommended to yield practical implications on how to best promote new information resources to university students. Questions for the university library such as the design of

appropriate instruction programmes for postgraduate students may be informed by studies such as this and.

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