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Table of Contents

EDITORIAL PREFACE

iv *Jo Lumsden, Aston University, Birmingham, UK*

RESEARCH ARTICLES

- 1 **It's Time There Was an App for That Too: A Usability Study of Mobile Timebanking**
Kyungsik Han, College of Information Sciences and Technology, Pennsylvania State University, State College, PA, USA
Patrick C. Shih, Department of Information and Library Science, Indiana University, Bloomington, IN, USA
Victoria Bellotti, Palo Alto Research Center, UC Santa Cruz, Santa Cruz, CA, USA
John M. Carroll, College of Information Sciences and Technology, Pennsylvania State University, State College, PA, USA
- 23 **The Intention to Use Mobile Digital Library Technology: A Focus Group Study in the United Arab Emirates**
Sumayyah Hassan Alfaresi, Brunel University, Uxbridge, UK
Kate Hone, Brunel University, Uxbridge, UK
- 43 **Biomechanics of Front and Back-of-Tablet Pointing with Grasping Hands**
Katrin Wolf, University of Stuttgart, Stuttgart, Germany
Markus Schneider, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany
John Mercouris, Illinois Institute of Technology, Chicago, IL, USA
Christopher-Eyk Hrabia, Technische Universität Berlin, Berlin, Germany

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The Intention to Use Mobile Digital Library Technology: A Focus Group Study in the United Arab Emirates

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ABSTRACT

This paper presents a qualitative study on student adoption of mobile library technology in a developing world context. The findings support the applicability of a number of existing constructs from the technology acceptance literature, such as perceived ease of use, social influence and trust. However, they also suggest the need to modify some adoption factors previously found in the literature to fit the specific context of mobile library adoption. Perceived value was found to be a more relevant overarching adoption factor than perceived usefulness for this context. Facilitating conditions were identified as important but these differed somewhat from those covered in earlier literature. The research also uncovered the importance of trialability for this type of application. The findings provide a basis for improving theory in the area of mobile library adoption and suggest a number of practical design recommendations to help designers of mobile library technology to create applications that meet user needs.

Keywords: Focus Group, Qualitative Approach, TAM, UAE, Zayed University

INTRODUCTION

Mobile library technology has great potential to improve student and researcher access to academic resources. It is also seen by libraries as a positive way to improve their image and to meet the needs of a younger generation of library users who are increasingly interacting with services via mobile devices. However, mobile library technology has to be implemented

in a way that is acceptable to end users in order to encourage usage and therefore be effective.

In Information Systems there is now a considerable body of research exploring acceptance factors in technology adoption. While there is extensive empirical evidence supporting the relevance of several broad theories of technology acceptance, there is also a growing concern that certain novel technologies may bring additional adoption issues that will not necessarily be

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uncovered by simply testing existing theories in a new context (e.g. Mallat, 2007). Another concern is the proliferation of theoretical models encompassing ever more constructs. While this can increase the explanatory power of the models, there is a concern that they are over-complex and that more parsimonious models may exist for particular application areas (e.g. van Raaij and Schepers, 2008).

The research described here focuses on the adoption of mobile library technology in a university library context. There are indications from previous research that mobile technology involves adoption factors which vary somewhat from those covered in generic adoption models (Kaasinen, 2008). Very little previous research has attempted to explore the relevance of existing adoption models to the mobile library context, and the few existing studies focus on outdated SMS-based services. This research therefore sets out to explore the factors which are most relevant to adoption of mobile library technology. A key contribution of the work is to augment current adoption theories in the context of mobile library technology. The findings also have potential practical implications for the successful implantation of mobile library applications in an academic library context. The empirical study described here was conducted in the UAE which, while classed as a developing country, has a very high penetration of smartphone technology. The developing world, particularly the Arab culture, have been under researched in technology adoption literature, so the research also has the potential to uncover issues relevant to this particular cultural context and provide a foundation for possible future cross-cultural research.

This paper begins by giving some background on mobile library services, and then it describes past literature in technology acceptance, in particular studies which address adoption of library and mobile technology. This is followed by a description of the methodology and data collection of the current study and a presentation of the results. Finally the findings and their implications are discussed.

MOBILE LIBRARY TECHNOLOGY

Although libraries today provide many digital resources such as e-books, databases and online catalogues, their resources are not always the first search choice for students (Buzynski, 2007). This might be related to the outdated image that students hold about libraries, an image that does not fit with the needs of the new generation of students who prefer receiving information quickly, and who rely heavily on technology to access information (Albrecht and Pirani, 2009; Prensky, 2001). Students increasingly rely on smartphones to access online services; these have the benefit that they are always connected, unlike desktops or laptops that usually require a person to be in a certain place in order to have Internet access (Choy, 2011). This suggests that students may be more willing to engage with library services if they are provided through mobile library applications; such applications could also help improve a library's image by providing a better match with the technologies that younger people are naturally adopting.

At present the number of libraries providing mobile services are few and are mainly limited to developed countries (Cao et al., 2006; Mills and Sheikh, 2010; Wilson and McCarthy, 2008). Currently, mobile services provided by libraries typically include library news, library hours, SMS reference service, 'ask a librarian', maps and laptop availability information (Vila, Galves and Campos, 2010). In recent years, there has been an increasing amount of literature on library services that can be provided by smartphones (Choy, 2010; Ezell, 2009; Fox, 2010; Kroski, 2008; Lippincott, 2008, 2010a). The design of these systems however, relied heavily on the researchers' own assumptions. A limited amount of research has addressed mobile libraries from a user perspective or looked at the features that affect adoption. It is also unclear whether existing findings from Western, developed contexts will apply in developing countries.

TECHNOLOGY ACCEPTANCE

Much academic literature on the adoption of new technology is dominated by the Technology Acceptance Model (TAM) developed by Davis (1989) and subsequent derivatives of this model. TAM assumes that perceived usefulness and perceived ease of use are the main factors influencing intention and behaviour in the use of a new information system (Choy, 2011). The little research that has specifically considered intention to use mobile libraries has also drawn on the TAM approach. Goh and Liew (2009) found support for the core TAM constructs in predicting intention to use an SMS-based library catalogue. In addition, they identified a role for self-efficacy in predicting intention. Goh (2011) subsequently identified gender differences in terms of the role of self-efficacy within their research model. However, both of these studies were limited as they only focused on SMS services rather than more interactive services which exploit the richer interactions enabled by modern smartphone developments.

TAM has been very widely used in studying adoption of technology of Information Systems in general. It has also inspired a number of variants whereby researchers have either added new predicting factors to the model or have adopted the main constructs. Notable examples include TAM2 (Venkatesh and Davis, 2000) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). TAM2 was developed to cover social factors that the original TAM lacks (Venkatesh and Davis, 2000). A number of subsequent variants of TAM also appeared in the literature, approaching technology from divergent perspectives and a focussing on different adoption domains (Oh and Yoon, 2014). Venkatesh et al. (2003) responded by developing an overarching technology adoption model (UTAUT), aiming to integrate the constructs from a number of existing theories. UTAUT reformulates perceived usefulness as performance expectancy and perceived ease of use as effort expectancy. Like TAM2, it also includes social

influence and it also adds facilitating conditions as a predictor of use behaviour.

UTAUT has been criticised by van Raaij and Schepers (2008) as being less parsimonious than TAM and TAM2, since it relies on a number of moderating factors in order to achieve its explanatory power. Van Raaij and Schepers (2008) also argue that the grouping and labelling of constructs within the model is problematic. For example, the 'facilitating conditions' construct combines disparate constructs such as perceived behavioural control, from Azjen's Theory of Planned Behavior, and compatibility, from Moore and Benbasat's (1991) operationalisation of Rogers' diffusion of innovation model (Rogers, 1995). Van Raaij and Schepers (2008) argue that these do not necessarily form a coherent psychometric construct. There is also a growing argument that generic adoption models such as TAM and UTAUT may need to be adapted for specific adoption contexts and types of implementation (Mallat, 2007; Orlikowski and Iacono, 2001).

As discussed above, no studies have specifically addressed the distinctive adoption issues for contemporary mobile digital library applications. However, there is related research which has considered mobile technology adoption in general, mobile technology in learning contexts and digital library adoptions. Kaasinen (2008) proposes a variant of TAM specifically concerned with mobile services. This technology acceptance model for mobile services (TAMM) differs from the original in that it reframes perceived usefulness as perceived value (to the user), bringing in ideas from value-centred HCI (Cockton, 2004) and value-centred software engineering (Boehm, 2003). TAMM also integrates the notion of ease of adoption, recognising that while in typical TAM usage scenarios technology might come ready installed, the situation will be rather different for mobile services. TAMM also integrates trust as an antecedent of intention to use. Kaasinen (2008) cites some case studies from different mobile domains supporting the relevance of TAMM to the design and evaluation of mobile services.

However, Kaasinen (2008) also acknowledges that the model may need to be revised for other kinds of service. A number of other studies from related usage domains (mobile, educational and digital library) have highlighted a number of additional potential adoption factors. The key findings from a review of this related research are summarised in Table 1.

It is clear from the related literature that there is a very wide range of potential adoption factors from related domains which may also be relevant to the adoption of mobile digital libraries. These include terminology, screen design, navigation, relevance, system accessibility, domain knowledge (Thong, Hong, and Tam, 2002), English literacy, library assistance (Park et al., 2009), social influence (Tan and Qi, 2009) and trust (Gao, Moe, and Krogstie, 2010). However, it remains unclear which of these might be relevant for the specific application of mobile libraries. In addition, the focus of previous research has been primarily in the West; research in developing countries has mainly been confined to the Far East and South East Asia. While Park et al. (2009) considered digital library acceptance in developing countries, the focus of their research was on usage of a large database of agricultural articles, distributed via CDs, representing a rather limited scope in terms of digital library implementation. In addition, the majority of their research sample was from either Sub-Saharan Africa or Latin America; fewer than 100 participants were categorised as being from Asia (and this sample was restricted to Indonesia and Nepal).

Given the lack of specific empirical research on mobile library adoption, it is clear that there are a great many potential factors which could form the basis for further exploration. Therefore research is needed to refine an adoption model for this domain. Much work in technology adoption tends to follow a hypothesis-driven, approach testing the validity of existing constructs identified in the literature, and in particular constructs from TAM. However, the drawback of this approach is that is not conducive to the discovery of new factors which may be unique to a new adoption

domain. There is also a proliferation of many possible adoption factors identified in previous research. It is advisable to restrict the number of constructs included within quantitative survey research, both from a practical perspective (in terms of what participants will tolerate) and from the point of view of specifying a tractable research model. This implies the need for a rigorous initial approach to selecting the strongest candidate constructs for hypothesis testing. For this reason, we argue for the utility of conducting exploratory work, following a qualitative focus group methodology (Barbour and Kitizinger, 1999). This can help identify the key constructs for this particular adoption domain and provide the opportunity to uncover new constructs. The next section describes our implementation of such a methodological approach to provide an in-depth exploration of the factors which affect user adoption of digital library systems, both in terms of assessing the applicability of existing models and highlighting the areas where new or modified factors appear more relevant. In this way the work augments existing adoption theories, providing a more concrete basis for future quantitative model testing research.

RESEARCH METHODOLOGY

A focus group approach was chosen, as this has previously been shown to be an effective method for studying innovative mobile services (Mallat, 2007). A mobile library prototype application was used as a stimulus during discussions with groups of students (representing the main intended user group for the mobile library implementation) and thematic analysis of the focus group discussions was used to draw out the main adoption themes. The following sections provide more detail of the procedure and approach.

Research Site and Sample

The research was conducted at Zayed University in the UAE. Zayed University was chosen because it is open to the idea of technology enhancements, having a fixed basic allocation

Table 1. Adoption factors identified from previous related studies

Construct	Description	Previous Work
Perceived usefulness	The degree to which a person believes that using a system will enhance his/her job performance (Davis, 1989).	Found to affect intention to use in multiple information systems application areas, including mobile libraries (Goh and Liew, 2009).
Perceived ease of use	The extent to which a person believes that using a system will be free of effort (Davis, 1989).	Found to affect intention use directly and indirectly through perceived usefulness in multiple studies, including the mobile library domain (Goh and Liew, 2009).
System accessibility	Degree of convenience that allows an individual to locate specific computer systems and access data and information (Thong, Hong and Tam, 2002).	Has been found to affect intention to use through perceived usefulness in the context of digital library adoption (Park et al., 2009; Thong, Hong, and Tam, 2002;).
Library Assistance	The extent to which librarians were helpful when assistance was needed (Park et al., 2009).	Found to be an important factor affecting perceived ease of use and perceived usefulness of e-library use (Park et al., 2009).
Relevance	In the context of digital libraries, relevance has been defined as the extent to which the library provides resources that match student needs (Thong, Hong and Tam, 2002).	Found to affect perceived usefulness of library services or mobile services (Kargin, Basolgu and Daim, 2009; Phan et al., 2010; Thong, Hong, and Tam, 2002).
Interface characteristics	The medium between the system and the user and the platform for user action. It consists of terminology, screen design, and navigation (Thong, Hong and Tam, 2002).	Found to affect perceived ease of use of a digital library system (Jeong, 2011; Ramayah, 2006; Thong, Hong and Tam, 2002).
Social influence	The person's perception that most people who are important to him think he should or should not perform the behaviour in question (Fishbein and Ajzen 1975, p.302).	A direct relationship with intention to use has been found in the context of Internet use, mobile commerce, and e-services (Bhatti, 2007; Fusilier and Durlabhji, 2005; Liao et al., 2007). An indirect relationship with intention through perceived usefulness in the context mobile commerce, e-services and e-learning (Bhatti, 2007; Lee, 2006; Liao et al., 2007).
Trust	User's belief or faith in the degree to which a particular mobile application has no security or privacy threats (Gao, Krogsite and Gransæther, 2008).	Significant effect on the intention to use through perceived ease of use in the context of mobile learning and digital libraries (Kim, 2010; Park, Nam, and Cha, 2012) and perceived usefulness in the context of e-services and mobile services (Liao et al., 2007; Lu et al., 2008).
Domain knowledge	An individual's knowledge of the field (Thong, Hong and Tam, 2002).	Found to affect perceived ease of use of a digital library system (Park et al., 2009).
Computing experience	An individual's general computer experience (Thong, Hong and Tam, 2002).	Found to affect perceived ease of use in the context of digital libraries (Park et al., 2009; Thong, Hong and Tam, 2002).
Mobile self-efficacy	Computer self-efficacy refers to an individual judgment of one's capability to use a computer (Compeau and Higgins, 1995, p.192). More recently mobile self-efficacy has been defined as more specific variant of self-efficacy (e.g. Duane et al., 2014)	Computer self-efficacy found to affect general computer usage (Igbaria and Iivari, 1995; Jeong, 2011; Park, Nam, and Cha, 2012). Mobile self-efficacy found to affect perceived ease of use of mobile payments but no direct effect on intention (Duane et al., 2014). Mobile self-efficacy found to influence attitude to mobile advertising (Lee et al., (2011)
English language skill	Having language skills in order to understand the system (Park et al., 2009).	Found to be a barrier to using a digital library system (Byrne, 2003) or the Internet in general (Du, 1999). Park et al. (2009) found a significant effect on perceived ease of use on e-library use.
Perceived ease of adoption	Refers to the degree of effort a user experiences in taking a service into use and relates to factors such as ease of installation, configuration and personalization of the service (Kaasinen, 2008)	Theorized to be an important potential barrier preventing users move from their intention to use a service to actual usage (Kaasinen, 2008)

of 210 million UAE Dirham (approximately US\$57M) per year for education and extra 6 million Dirham just for technology refreshment (ZU Self-Study Report, 2008). In addition, Zayed University already offers examples of mobile learning. It is university that aspires to integrate technology into its teaching and learning environments and to graduate students who are effective users of technology (ZU Self-Study Report, 2008). The UAE, while part of the developing world, has the remarkably high mobile technology penetration rate of 210% (Buddecomm, 2010).

Nine focus group discussions were held with a total of 44 student participants. The student groups were divided by level of study (undergraduate, postgraduate) and gender. There were three focus groups with female undergraduates (n=4 for each), three for male undergraduates (n=4 for each), two female postgraduate (n=9 and n=5) and one for male postgraduates (n=6). The composition of the groups was organised following the advice of Krueger and Casey (2009), who argue that mixing people with different levels of expertise or power related to the issue should be avoided in order to provide a more comfortable environment for participants and to prevent domination of the group by certain individuals.

Procedure

The focus group discussions were held within the university library. A moderately structured approach was adopted as the most appropriate to uncover both the research questions and the participants' interests (Morgan, 1998). The moderator's role was thus to facilitate the discussion and present the focus group with a series of questions. The moderator was responsible for keeping the conversation focused on the topic. Participants were always led back to the topic under discussion if the comments they were making were not relevant. They were reminded of the importance of hearing everyone's ideas, respecting others' opinions and the importance

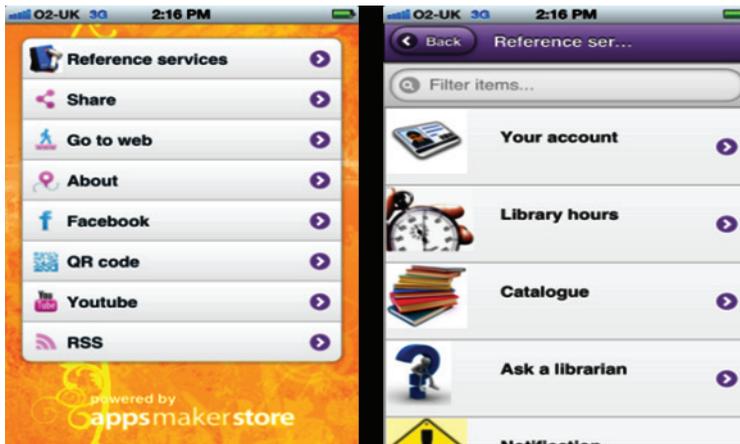
that only one person talk at any one time. Participants were also reminded that there were no right or wrong answers.

The first stage of all groups started with a general discussion about the concept of the mobile library. After that, participants were asked to list a number of services on a sheet of paper to give them time to think. Then they were asked to read aloud their services and pick the most important thing out of the list for the sake of locating the most needed services (Krueger and Casey, 2008). Although Davis and Venkatesh (2004) stated that user acceptance can be predicted in the early pre-implementation phase (before building a working prototype or even writing a single code), little awareness of the mobile library concept was expected at the early stage of focus group discussion in this case. Thus a mobile library prototype was constructed as a stimulus material to get users involved in generating ideas and thinking about their needs that can be met by using this program (see Figure 1). The application involved a number of services, including library hours, ask a librarian, the library catalogue, users account, booking study room, notification of overdue materials, and YouTube, Facebook and RSS feeds for library news. Participants were asked to: point out the positive and negative features of the application; find key points that might help in marketing the application; suggest methods to enhance the application; and state what they required to know about the application in order to accept it or reject it. Ethical approval was granted from the Zayed University Research Office and from Brunel University Ethics Committee. Additionally, at the beginning of each session participants were told that the session would be recorded and they were invited to sign consent forms.

Data Recording and Analysis

The discussions were recorded, translated, transcribed, and coded using Nvivo. Thematic analysis was applied to the data. This technique

Figure 1. Mobile library prototype



is suitable for use with any form of qualitative data (Boyatzis, 1998). The process of thematic analysis originates from two approaches: deductive and inductive (Bernard and Ryan, 2010). Bernard and Ryan (2010) argue that research is never purely inductive or deductive, but is generally mostly inductive in the exploratory phase and mostly deductive in the confirmatory stage. This research mixed both approaches, beginning with a deductive phase to identify themes matching those identified in the literature and following with a stage of inductive coding to look for new emergent themes.

During the deductive coding phase, the constructs identified in previous related literature (shown in Table 1) were used as the a priori constructs. In addition to the deductive coding, an inductive approach was used to identify supplementary themes emergent from the data which were not already represented by the a priori codes generated from the literature. Finally, the data was examined for evidence of relationships between identified themes/constructs, both to look for confirmation of relationships identified in the previous research and to generate new relationships specific to this research context. The overall aim of the analysis was to identify and group determinants of mobile library adoption.

FINDINGS AND DISCUSSION

Analysis of the focus group discussion revealed a number of themes that generally supported the factors identified from previous literature, with some modifications. Several new themes were also identified through inductive coding. The sections below describe and discuss the results in more detail.

Theme 1: Perceived Value

A number of discussions broadly addressed the ways in which participants envisaged the mobile library would provide value to them. These included perceived usefulness, quality of working life, mobility, relevance and novelty/distinctiveness.

Perceived Usefulness

Perceived usefulness was intensively discussed in all focus groups and linked with many other factors, supporting the applicability of previous findings to the mobile library context (Chang and Tung, 2008; Goh and Liew, 2009; Thong, Hong, and Tam, 2002; Venkatesh and Davis, 2000). Usefulness was clearly related to intention to use, as students agreed that they would definitely use the app because it facilitates their

work and solves many problematic issues they habitually face. They perceive smartphone use, and use of the app, as being convenient and useful, saving their time, which promotes their acceptance of such technology. The program would thus satisfy their needs and facilitate their communication with the library. Typical comments include:

Yes. It will be very useful for students.

It will help me not to come and go to check the library. It saves my time.

It will be helpful for research.

Quality of Working Life

A closely related construct also emerged inductively, whereby participants discussed how the app would make users' lives easier. A sample of comments includes:

Make student's life much easier. It is easy to book a room and many other services.

Yes easier. Really the university students are in need for this program.

Make your life easy.

Interestingly, recent work by Tarhini et al. (2014) found Quality of Working Life to be a significant predictor of intention to use an e-learning system within an Arabic World context. The inductive identification of a similar construct in our work suggests this might also be worth investigating further in relation to mobile libraries.

Mobility

In the initial deductive coding of the data, a number of comments were found which could be coded under the system accessibility construct (see Table 1). However, it was felt that this construct did not adequately capture

the full meaning of the themes that emerged from the discussion. After iterative inductive coding, the alternative construct of 'mobility' was proposed to better represent the fact that participants' conception of system accessibility has shifted with the widespread adoption of mobile technology; the focus becomes less on the ability to locate computers and more on the ability to connect anywhere, anytime.

Mobility was a highly important issue raised by all focus groups. Focus group users are looking for a 'movable library'. Students carry around their smartphones and tablets to get instant access in their cars, classes, homes, or anywhere while they are on the move. Many students mentioned that mobile library would reduce their attendance in the library or at least manage their attendance. They believe that there are certain services that can be addressed remotely without having the need to be in the library. One participant (P30) mentioned: "*we all have phones, but we still come to the library. If this application is available we do not have to come for every service*". In that sense, mobility has an impact on students' intention of use.

Comments from students also suggest that mobility is in itself a key influence on perceived usefulness. The mobility of the service provides much of its utility from a student perspective as they described needing to renew a book or, book a study room remotely. Furthermore students described how the mobility that smartphones provide makes it easy for them to use library services. They described this process as a successful and easy access. This suggests that mobility has an impact on perceived ease of use and/or quality of working life. This is captured by the following quote: "*The smartphone is everywhere which makes it easier to use the library*".

Relevance

It was clear from focus group discussions that students are looking for innovations that suit their needs, supporting the importance of relevance. Students listed a number of features and functions that they would require from the

system which would make it relevant to their needs. Interestingly, the concept of relevance emerged as dynamic and context-dependent, so that different functions would be relevant for different contexts of use (in terms of location, technology and mobile coverage). The discussion of relevance overlaps with several other themes including perceived usefulness, quality of working life, mobility and interface design.

For example:

...you don't know what it is going to happen whether you are outside or something suddenly you get this notification that you have to solve. You have to think of it.... Whenever you want to solve an issue solve it on the spot and that's it. Forget about it.

Or maybe an app that allows you to search about a book, rather than going through the shelves. It will waste our time.

Novelty/Distinctiveness

Distinctiveness was a new construct discovered inductively. Most student groups were not directly saying that using the app would make them feel distinctive, but they intimated that the app was more acceptable because of its preferential qualities that in a way enhance their image and make them feel unique. Thus some of the value they attach to the application comes from its novelty or distinctiveness.

Female postgraduate groups were looking for a privilege of using something associated with being “creative”, “brilliant”, “useful”, and “a new program that cannot be found elsewhere”. The male postgraduate group also found the app to be a “great idea” and “a ground breaking technology”. Female undergraduate groups believe that the idea itself would receive an award. They indicated that it is a new application that they have not heard about before, and they would be among the first people to use it due to its originality and utility:

I feel it's something new. I haven't heard any university started using this application.

The distinctiveness factor identified here has features in common with the concept of image identified in some previous work. For example Hong et al. (2006) and Kargin, Basoglu, and Daim (2009) believe users like to feel unique because of their services. Kargin, Basoglu, and Daim (2009) found that image significantly affects the perceived usefulness of mobile services. Our focus group discussion supported a similar relationship between distinctiveness and perceived usefulness, for example:

New program, useful.

Maybe because this program is original, useful for many students. For me I will be among the first people who use it.

Theme 2: Perceived Ease of Use/Free of Effort

Perceived ease of use was discussed deeply in all focus groups and linked with a number of other factors. Generally, students' main concern was that the app should be user-friendly and easy to use, otherwise they would not bother to use it or download it. This suggests a clear relationship with intention to use. There was also recognition from participants that by making it easy to use, the application would better serve users, giving them better access to the information they need. This suggests a relationship with perceived usefulness. Relevant comments include:

My main emphasis is to have user-friendly otherwise I wouldn't use it a lot you know.

I think I will advise everyone to use it because it is very easy and friendly. It will serve them.

Within the broad theme of perceived ease of use, a number of contributing themes emerged relating to interface design, mobile self-efficacy, library assistance and English literacy.

Interface Design

The three united interface characteristics (terminology, navigation, screen design) (Thong, Hong, and Tam, 2002) within the specific context of use on a small screen (coded inductively) emerged from discussion as such tightly interwoven concepts that we have coded them under one broad theme of interface design. Participants discussed customisation and the use of images and short cuts as important design features:

One more thing. I think we can re-arrange the order of the services by getting into our accounts. First you log in, then you arrange.

Pictures make you understand immediately.

We like short cuts.

There was also a strong emphasis on having a user-friendly or usable mobile application, and comments about interface design features were very strongly expressed within this narrative. Ordering of services on the screen and organising services into categories with simple terminology were discussed as examples of features that led to ease of navigation and consequently ease of use. The discussions suggest a strong antecedent relationship from these design features to ease of use, as illustrated in the following quote:

If you make it user-friendly with not enough content still ok but if you make it brilliant but hard to navigate no one will use it.

Some discussion also reflected the inter-relationship between interface design and screen size. A number of students mentioned

that smartphone screen size would not attract them to use the library database or read full articles, while they would be more comfortable reading on their ipad or tablet:

I just don't like to have a lot of text on my mobile. I am not going to read it on my mobile because it is little bit annoying.

This illustrates that in terms of functionality the interface should easily provide access, varying according to the context/device used.

Mobile Self-Efficacy

It was clear from discussions that students felt that this factor could have a positive or negative impact on mobile library use. For some, their existing confidence in using smartphones gave them confidence that they could also use this app. There was also some suggestion that mobile self-efficacy might mediate the relationship between social influence and perceived ease of use. Thus, a participant in one of the female postgraduate groups compared her capability of use to other students, saying "I would see if someone else used it before and ask them if it is really useful. If it was easy for them, then it is easy for me. I am no less than them". She reasoned that if her peers were capable of using the application then she would feel herself able to as well. A relationship between mobile self-efficacy and perceived ease of use aligns with Duane et al.'s (2014) findings in relation to m-payment adoption.

English Literacy

An interesting finding that emerged was that although students (whose native language is Arabic) consider themselves literate in English, they would like to include both Arabic and English in the app. Having both languages will make the app easy to use and match their search needs:

We can make it Arabic and English.

Both. I prefer if it gives me the choice to select the language.

If you can do it in every language is a good thing... I mean that it is better to have the choice.

.... But there are some students especially first year students who are not sufficient in English.

We should consider them. It must be easy for them to use.

Clearly this is an example of a factor which is related to the specific cultural setting in which the focus groups took place, but it may also be relevant in a number of countries where the medium of instruction used in higher education is English but where it is not the first language of the majority of the population.

Theme 3: Trust

Trust emerged clearly as a factor from the focus group discussions, as did its impact over intention to use. Within the general discussion of trust it was interesting to note that a number of facets of the construct emerged, including security, reliability and credibility, as discussed below.

Security

Interestingly, there was a difference between male and female students when it comes to their perception of security and trust issues in relation to online payment. Female participants were concerned about the security of their accounts or the security of mobile payment. They wonder if it is safe to download such an application on their mobile and to pay online by mobile. P29 asked: "is it safe to use or download on my phone? Is it safe for my account?" When they were asked whether they trust paying using their mobile, P29 clearly said: "no", but P7 mentioned: "I trust my mobile because there is no money in my account", which implies that she does not actually trust that method of payment. They think that direct, traditional payments are safer. P30 observed that it is "better to pay cash or by

card", and P31 and P32 would rather come to the library to pay: "I will come to the library to pay"; "I prefer if they can tell us only come and pay your fees. We will come in that case and pay for the library". Postgraduate male students on the other hand felt more secure about an online payment service. Indeed, they specified that this would be the most important benefit of the service. P13 stated: "yes I trust my mobile", and P11 declared: "if they are going to send me a reminder I will be thinking of a way to pay".

Reliability

Female undergraduate groups were also concerned about the reliability of the information and who might be involved in designing the app and providing this information. The following quote provides an example of their reliability concerns:

If the application is reliable too? Who has developed it?

Credibility

Conversely, male undergraduate groups believed that the university will provide them with reliable trustworthy information; if the University developed the app then they would trust it. There therefore appears to be a close association between the credibility of the developer and expectations around reliability:

If it is developed by the University, then it is reliable.

Theme 4: Social Influence

The importance of consulting and interacting with social networks was confirmed through focus group discussions. Students showed an initiation of consulting their friends who already started to use the app or their teachers who probably asked them to download it. A number of participants would also influence

the decision of their friends and push them towards using the app:

I would say to my friends you have to have it. I will push them to have it because you don't know what is going to happen...

If a teacher asks us to download it we are going to download it.

Several previous studies implied that there is a relationship between social influence and perceived usefulness (Bhatti, 2007; Lee, 2006; Liao et al., 2007). While this did not emerge strongly from the focus group discussions, one participant's comment does lend some support for such a relationship:

I would see if someone else used it before and ask them if it is really useful. If it was easy for them, then it is easy for me. I am no less than them.

Interestingly, this quote also suggests a relationship between social influence and perceived ease of use, because seeing someone else use the application would give this person confidence that they too could use it.

Theme 5: Facilitating Conditions

Several issues could be broadly grouped into conditions which facilitate the use of mobile technology. These include technical issues of system coverage, library assistance and also the characteristics of the users.

System Coverage

From inductive coding we identified a category of facilitating conditions specific to the use of mobile technology, which was the availability of mobile or Internet coverage. Participants mentioned that the unavailability of wireless connections might prevent them from using the mobile program outside the university, as P18 said:

And if there is no connection also we will not be able to use it. For example, if we are in car or a mall and we do not have Internet coverage.

One female postgraduate group suggested a mobile program that works offline to avoid Internet coverage issues. Thus:

If they can create an app that does not require a wireless connection.

Even from anywhere even if no net is available.

The discussion thus suggests that system coverage would affect usage, though this could be somewhat offset by appropriate system design. System coverage also seems closely related to mobility.

Library Assistance

Park et al. (2009) previously identified library assistance as a factor affecting both perceived ease of use and perceived usefulness of a digital library. While their justification for including this was previous research on the value of technical support, their operationalisation of the construct focused primarily on the role of support from librarians. The findings of our focus group discussions supported a broad conception of library assistance, encompassing support from both librarians and teachers as well as technical support. Although library technical support was not mentioned intensively in all focus group discussions, it was raised in more than one group. A female postgraduate respondent expected assistance in using library services, especially for finding books. Another also expected assistance for using the app itself. Similarly, a male undergraduate respondent expected assistance for using the app but from the teacher who would ask them to use it.

It was not obvious from focus group discussions whether there is a relationship between library assistance and perceived usefulness. However, there is a hint of relationship with perceived ease of use:

It is a mobile phone you should be able to talk with your library.

Like ask a librarian or contact information.

I need to know how it works.

Maybe asking if this book is available.

But this requiring a really human process behind that, you can't forget that real human beings are required to do that.

Mobile and Web Search Experience

While previous digital library research has suggested that domain knowledge is an important predictor of perceived ease of use (e.g. Thong, Hong, and Tam, 2002), subject-specific knowledge did not emerge strongly as a theme from our focus group discussions. The more generic experience dimensions of smart phone experience and web searching skills were discussed more frequently. The results show that users with no smart phone background are not in favour of using library services via smart phone. However, more experienced users felt it was inevitable that in future everyone would be using the technology. This is illustrated by the following exchange:

I am using an old phone, so what is going to happen to me?

When you back to the marketing numbers you find out the uptake for the smartphone, you can see shocking numbers. It is about 80% of the newcomers to the market that have a smartphone. So, sooner or later you will change your phone.

Discussions also showed that a number of participants had strong experience of web searching and tend to consult a number of different sources, for example they cross-check available resources in the library with reviews on Amazon. Users with strong search experi-

ence tended to expect advanced search features to be provided in the app, suggesting possible relationships between search experience and relevance. Illustrative quotes include:

And as [P6] said I can see the review of this book from Amazon or others because for example I search Zayed [online library catalogue] and then for quality I search Amazon and see how many stars are there.

I need to search by the author, title and so on.

There also appeared to be a relationship between web search experience and smart-phone experience, in that those with high search knowledge are also more skilful smartphone users.

Theme 6: Trialability

A number of comments, coded inductively, suggested that users like to experiment with new technology before deciding to adopt it. A number of students mentioned that they would have to try the app first to judge their capability of use. Two male undergraduate groups were uncertain about their capability of use, so they proposed to try the app first and then decide. This suggests a possible relationship between experimentation and mobile self-efficacy judgements:

I have to try it first in order to decide to use it.

We have to. For example how can I borrow a book? I have to know. I have to try it first.

I will have to try it first if I do not like it I will delete it.

This theme appears to align closely with the concept of trialability introduced in Rogers' Diffusion of Innovation work. Rogers (1995) defined trialability in terms of how easily an innovation can be experimented with. This theme has some resonance with Kaasinen's

(2008) notion of ease of adoption, except that participants did not appear to anticipate issues in installing or removing the application; ease of adoption to smartphone apps thus appeared as something of a given for this user population.

CONCLUSION AND FUTURE WORK

The purpose of this study was to explore factors that affect the intention to use mobile library service. The study was exploratory in nature and was intended to augment existing technology acceptance models by investigating their applicability in this new adoption situation. As well as guiding theory development, the work provides some practical implications for designers and implementers of digital library applications and a number of directions for future work.

A summary of the main findings from the focus groups is shown in Table 2. We grouped

the adoption issues discussed by participants under six main themes. Within these a number of contributing factors could be identified. Many of these factors have been identified in previous studies, but some needed to be modified for this setting and the combination of factors is unique to this application area. Some issues, while present in earlier general adoption literature, have not been previously highlighted in relation to mobile or library systems adoption. Finally, some constructs from the library and mobile technology adoption literature failed to be supported within the context of this study. These findings are discussed in more detail in Table 2.

Theoretical Implications

This research provides a number of theoretical contributions to the existing understanding of mobile library adoption. The first is to highlight the importance of perceived value as a broad adoption driver, supporting earlier work on

Table 2. Factors affecting adoption of mobile library technology

Adoption Factor	Contributing Items
Perceived value	Perceived usefulness
	Quality of working life
	Mobility
	Relevance
	Novelty / distinctiveness
Perceived ease of use	Interface design
	Mobile self-efficacy
	English literacy
Trust	Security
	Reliability
	Credibility
Social influence	From peers
	From teachers
Facilitating conditions	System coverage
	Library assistance
	Mobile experience
Trialability	

mobile adoption (Kaasinen, 2008). While much TAM literature is dominated by the concept of the perceived usefulness, this tends to reflect the organisational technology adoption roots of TAM. For consumer and student services, users seem concerned with a greater range of benefits of technology than the rudimentary functionalities of helping them with their work. While perceived usefulness remained a feature that was widely discussed, students also emphasised the benefits in terms of the quality of their working life (supporting recent findings from Tarhini et al., 2014). Mobility was also perceived as a significant benefit in itself. While the mobility construct was coded inductively in this research, it also appears in earlier literature. According to Kargin, Basoglu and Daim (2009), mobility means having the ability to access resources anywhere, anytime. Research shows that the more mobile the user is, the more valuable mobile computing becomes (Pagani, 2004). Mallat (2007) also identified a mobility construct through qualitative work on m-payment adoption, which she categorised as contributing to the relative advantage of a system (which is conceptually similar to perceived value). Novelty/distinctiveness of the service was identified as new construct in this work, which also appeared to present a value to users. We propose therefore that perceived value will have a significant effect on behavioural intention to use mobile library technology, and that perceived usefulness, quality of working life, mobility, relevance and novelty/distinctiveness will all contribute to perceptions of value in the context of mobile libraries. While both value-centred HCI (Cockton, 2004) and value-centred software development (Boehm, 2003) have been suggested previously, our results suggest that adoption research for more modern consumer-driven products might usefully revisit these ideas.

A second contribution of the research is to support the relevance of the TAM construct of perceived ease of use within the context of mobile library adoption, supporting its applicability in many IS domains (Gao, Moe and Krogsite, 2010; Goh and Liew, 2009; Hong, Tam and Kim,

2006). The research supported the relevance of user interface design factors in contributing to perceived ease of use, supporting previous studies (Jeong, 2011; Ramayah, 2006; Thong, Hong, and Tam, 2002). It also suggested that mobile self-efficacy influences user judgements of ease of use and highlighted a new relationship between language choice and ease of use, which is likely to be relevant in domains where English is the language of study or work, but is not the first language of users.

The research also confirmed the importance of trust issues in mobile service adoption. Our research highlighted three issues which were relevant to mobile library adoption in this regard: security, reliability and credibility. Kaasinen (2008) suggested that trust should be included in a model of mobile service adoption as an antecedent to intention to use, and our results are supportive of this contention.

A further contribution of the research is to support the relevance of social influence in the adoption decisions around mobile library technology. This aligns with a wide body of previous adoption research, including research specific to mobile library adoption, albeit with outdated SMS services (Goh and Liew, 2009). Students mentioned the role of both their peers and their teachers in influencing their adoption. Social influence is thought to be a more important determinant of adoption in cultures which are collectivist and high in power distance. Since Arabic cultures are generally thought to exhibit these characteristics, it is possible that context may have played some role in the emergence of this construct in the focus groups (Hofstede, Hofstede and Minkov, 2010).

The research also highlighted the importance of a number of facilitating conditions in supporting the likelihood of adoption. One of these was around the technical infrastructure to support mobile access (system coverage). This needs to be good enough to enable users to access the service while on the move. Another factor was the availability of support, and the third factor was the degree of mobile experience among users. This conception of facilitating conditions has some overlap with the construct

used in UTAUT (Venkatesh et al., 2003) but also some key differences. Venkatesh et al.'s (2003) facilitating conditions dimension includes the notion of support and also (from perceived behavioural control) some items on background knowledge. However, it also includes compatibility, which did not emerge as a facilitating factor here. The notion of system coverage is specific to the mobile context and is a new element of facilitating conditions that emerged in this study. Some previous research had suggested the relevance of system accessibility as a facilitating factor. Thong et al. (2002) define this as the convenience allowing an individual to locate specific computer systems and access data and information. This was not supported in our focus group results, and instead the related concept of system coverage emerged as being more relevant to the mobile context.

Finally the results highlighted the role of trialability in mobile library adoption. While trialability is a feature of Rogers' (1995) Diffusion of Innovations model, it has not received much attention in more recent technology adoption literature. This theme may be indicative of the way that users now interact with mobile apps. The low barriers to entry (in terms of both cost and access) encourage them to try the technology. While this makes the initial adoption decision relatively easy, the flip side is that the technology can be discarded equally easily if the user does not like it in practice. This suggests that the emphasis in studying adoption of this kind of technology should be on *intention to continue using* the technology after initial engagement, rather than *intention to use* in itself. This represents a potential shift in adoption studies which would be worthy of future exploration.

Methodologically, the study supports the usefulness of a qualitative, focus group-based approach during the exploratory stage of research into adoption of new technology solutions. A number of new or revised constructs emerged from our qualitative analysis which would not have been uncovered through a hypothesis-driven approach based solely on past literature.

Practical Implications

There are implications from this work for both the designers of mobile library applications and for organisations who wish to successfully implement such solutions. The first implication is that designers need to understand what users will value from a mobile library system and design the features and implementation to fit these user needs. Participants in the focus groups would value an easy and useful mobile library application that provides unique services that cannot be obtained elsewhere. The availability of RSS feeds and social networks would allow them to integrate their usage of the app within their existing social networking activities. The availability of tutorials would train students and improve their skills in mobile and web search experiences. A map service that would show the exact location of a required book and a remote printing service would attract students by covering their need for mobility.

The application of value-centred software development processes might represent a practical means of addressing this issue (Boehm, 2003). Our research suggests that users perceive significant benefits from the very mobility of the service, suggesting that such applications will be popular among users, and that organisations should therefore invest effort and funds in developing such services in order to improve student satisfaction. The research also highlights the importance of designing for usability. The findings suggest that designers should consider the use of specific terms that relates to students; arrange the screen in a certain way to focus on pictures rather than text and allow for customisation; and design a shallow structure that does not involve intensive navigation. For the UAE educational context, giving the user the choice of selecting Arabic or English language while using the app would also be expected to improve the perceived ease of use.

Trust emerged as an issue for participants in the study. The findings also suggested some ways by which trust might be increased. We propose that system designers should focus on building an app that protects the privacy of

the users and clearly mention that the app is developed by the university to give them a sense of trust. Since social influence was seen as a relevant adoption factor, organisations should ensure that staff members work to highlight the benefit of the app to students whenever possible.

Finally, the results suggest that organisations need to invest in infrastructure, support and training in order to encourage uptake of mobile library technology. Within the organisation, efforts should be made to ensure that Wi-Fi coverage and mobile Internet connectivity is adequate for the intended user group across the whole campus. Relevant staff assistance should be made available and it may also be beneficial to include an 'ask a librarian' service in the app to support students' need for assistance. Organisations should also invest in developing the digital literacy of their students and staff so that they are better able to benefit from mobile library interventions.

Limitations and Future Work

As with any empirical research there are some limitations to the current study. One limitation was that the sample for the focus groups was confined to one geographical and cultural context. There are some reasons to think that many of the results identified here might be generalised to other settings; many of the issues identified align with those previously found in other diverse cultural settings, and most libraries provide similar services worldwide. Additionally, the UAE is a wealthy country with high penetration of mobile technology. On the other hand, the special context of Middle Eastern universities certainly has pedagogical and other implications. The adapted version of the factors derived from the developed world or the new factors that were found in this context might be related to the fact that Zayed University segregates female and male students in terms of library access (they have limited time to access the library as each gender is assigned a separate time window to access the building). Zayed University Library also still relies on the traditional system of borrowing books; for

example, self-check in/out, which is universally available in the developed world, has not been implemented in Zayed University. Students rely heavily on librarians and no tasks are delegated to users. It therefore remains a question for future research to explore the extent to which the adoption factors identified in this study will also hold for mobile library acceptance in other countries. Future work could therefore repeat this study within other cultural settings.

While focus groups were helpful for providing a rich understanding of the problem domain, the method does present limitations in terms of relatively small sample size. Mallat (2007) suggests that while small sample sizes can be problematic in terms of generalising to a larger population, they can be valid as a means of establishing generalizability for theory in a mobile adoption context. Mallat (2007) also proposes that the results of qualitative exploratory work can usefully form the basis for defining theoretical hypotheses which can be tested further by different methods and with larger sample sizes. The theoretical implications section presented above illustrates a number of research questions arising from this research which would be suitable for future quantitative examination. It would also be interesting to explore whether some of the newly identified themes will also apply to a wider range of mobile technology solutions.

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The primary objective of the **International Journal of Mobile Human Computer Interaction (IJMHCI)** is to provide comprehensive coverage and understanding of the issues associated with the design, evaluation, and use of mobile technologies. This journal focuses on human-computer interaction related to the innovation and research in the design, evaluation, and use of innovative handheld, mobile, and wearable technologies in order to broaden the overall body of knowledge regarding such issues. IJMHCI also considers issues associated with the social and/or organizational impacts of such technologies.

COVERAGE/MAJOR TOPICS:

- Case studies and/or reflections on experience on experience (e.g. descriptions of successful mobile user interfaces, evaluation set-ups, etc.)
- Context-aware/context-sensitive mobile application design, evaluation, and use
- Design methods/approaches for mobile user interfaces
- Ethical implications of mobile evaluations
- Field-based evaluations and evaluation techniques
- Gestural interaction techniques for mobile technologies
- Graphical interaction techniques for mobile technologies
- Issues of heterogeneity of mobile device interfaces/ interaction
- Lab v. field evaluations and evaluation techniques
- Lab-based evaluations and evaluation techniques
- Mobile advanced training application design, evaluation, and use
- Mobile assistive technologies design, evaluation, and use
- Mobile commerce application design, evaluation, and use
- Mobile HCI lab design/set-up
- Mobile healthcare application design, evaluation, and use
- Mobile interactive play design, evaluation, and use
- Mobile learning application design, evaluation, and use
- Mobile technology design, evaluation, and use by special (needs) groups (e.g. elderly, children, and disabled)
- Multimodal interaction on mobile technologies
- Non-speech audio-based interaction techniques for mobile technologies
- Other emerging interaction techniques for mobile technologies
- Other related issues that impact the design, evaluation, and use of mobile technologies
- Speech-based interaction techniques for mobile technologies
- Tactile interaction techniques for mobile technologies
- Technology acceptance as it relates to mobile technologies
- User aspects of mobile privacy, security, and trust
- User interface architectures for mobile technologies
- User interface migration from desktop to mobile technologies
- Wearable technology/application and interaction design, evaluation, and use



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