

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/220677274>

# SMS-based library catalogue system: A preliminary investigation of user acceptance

Article in *The Electronic Library* · June 2009

DOI: 10.1108/02640470910966853 · Source: DBLP

---

CITATIONS

34

---

READS

671

2 authors, including:



Chern Li Liew

Victoria University of Wellington

99 PUBLICATIONS 886 CITATIONS

SEE PROFILE



## The Electronic Library

SMS-based library catalogue system: a preliminary investigation of user acceptance

Tiong T. Goh Chern Li Liew

### Article information:

To cite this document:

Tiong T. Goh Chern Li Liew, (2009), "SMS-based library catalogue system: a preliminary investigation of user acceptance", The Electronic Library, Vol. 27 Iss 3 pp. 394 - 408

Permanent link to this document:

<http://dx.doi.org/10.1108/02640470910966853>

Downloaded on: 13 August 2015, At: 17:42 (PT)

References: this document contains references to 40 other documents.

To copy this document: [permissions@emeraldinsight.com](mailto:permissions@emeraldinsight.com)

The fulltext of this document has been downloaded 2108 times since 2009\*

### Users who downloaded this article also downloaded:

Chiao-Chen Chang, (2013), "Library mobile applications in university libraries", Library Hi Tech, Vol. 31 Iss 3 pp. 478-492 <http://dx.doi.org/10.1108/LHT-03-2013-0024>

Jen-Hung Huang, Yu-Ru Lin, Shu-Ting Chuang, (2007), "Elucidating user behavior of mobile learning: A perspective of the extended technology acceptance model", The Electronic Library, Vol. 25 Iss 5 pp. 585-598 <http://dx.doi.org/10.1108/02640470710829569>

Sridevi Jetty, John Paul Anbu K., (2013), "SMS-based content alert system: a case with Bundelkhand University Library, Jhansi", New Library World, Vol. 114 Iss 1/2 pp. 20-31 <http://dx.doi.org/10.1108/03074801311291938>

Access to this document was granted through an Emerald subscription provided by emerald-srm:364528 []

### For Authors

If you would like to write for this, or any other Emerald publication, then please use our Emerald for Authors service information about how to choose which publication to write for and submission guidelines are available for all. Please visit [www.emeraldinsight.com/authors](http://www.emeraldinsight.com/authors) for more information.

### About Emerald [www.emeraldinsight.com](http://www.emeraldinsight.com)

Emerald is a global publisher linking research and practice to the benefit of society. The company manages a portfolio of more than 290 journals and over 2,350 books and book series volumes, as well as providing an extensive range of online products and additional customer resources and services.

Emerald is both COUNTER 4 and TRANSFER compliant. The organization is a partner of the Committee on Publication Ethics (COPE) and also works with Portico and the LOCKSS initiative for digital archive preservation.

\*Related content and download information correct at time of download.



TEL  
27,3

394

Received 16 January 2008  
Revised 29 February 2008  
Accepted 12 March 2008

# SMS-based library catalogue system: a preliminary investigation of user acceptance

Tiong T. Goh and Chern Li Liew

*School of Information Management, Victoria University of Wellington,  
Wellington, New Zealand*

## Abstract

**Purpose** – The purpose of this paper is to investigate potential users' cognitive beliefs and intention to use (IU) a proposed short message service (SMS)-based library catalogue system. The motivation for this research is the growing popularity of mobile information systems and the need to explore if SMS is a technology that libraries could tap into to enhance their services to users.

**Design/methodology/approach** – A review of literature on SMS-based services and applications within the library sector is followed by a prototyping of an SMS-based library catalogue system and the development of a number of hypotheses using the technology acceptance model (TAM) as the base framework. The study investigates potential users' cognitive beliefs and IU the systems as well as the effect of self-efficacy (SE) on these. A survey questionnaire is distributed to a purposeful and convenient sample of university students who are also users of the university library online public access catalogue.

**Findings** – The results of the data analysis show that SE has a positive impact on the perceived ease of use (PEOU) and a negative impact on perceived usefulness (PU). The findings also show that SE does not have direct impact on IU. The overall model explains 55.2 per cent of behaviour intention in using the proposed system. This is comparable with other TAM models in the context of SMS usage.

**Originality/value** – There is scant research available in the literature on user acceptance of SMS-based systems. This study and its findings provide new insights for understanding user motivation for using SMS-based systems, specifically for SMS-based library catalogue systems. This understanding can aid the efforts when designing and promoting the use of such systems. The study also examines SE alongside the user technology acceptance constructs of PEOU, PU and IU.

**Keywords** New Zealand, University libraries, Catalogues, User studies, Information media

**Paper type** Research paper

## 1. Introduction to study

In the 2006 film, *The Da Vinci Code*, the main characters, Robert Langdon and Sophie Neveu while on the run, borrowed someone's mobile phone (which had a web browser) on a London city bus to check the relevance of "A. Pope" in their attempt to crack the Da Vinci code after they realised it would take too long for them to get to the library. The search and the subsequent retrieval of the search findings seemed absolutely fuss free and the film protagonists got their answers in the most painless manner in just a couple of minutes. In a real situation however, if one were to carry out a similar search, would it be as effortless as portrayed in the film? Will library users actually find such systems useful and will they want to use them for searching library online public access catalogue (OPAC)?



With the growing popularity of mobile phones and short message service (SMS), a number of studies that look at the user interface design and usability of mobile devices and their small interfaces (Buchanan *et al.*, 2001; Ericsson *et al.*, 2001) have emerged in recent years. Usability has become a crucial requirement for services provided through such devices because of the relatively small screens and keypads that users must operate on. Most mobile devices rely on numeric keypads with multiple characters mapped to each button for text input. This process is relatively slow and more tedious compared to working with a keyboard on a laptop or PC especially when entering more than a few characters. Mobile devices also tend to have small, lower resolution screens that allow only a few lines of text to be displayed at a time (i.e. 160 characters including white space if a seven-bit encoding is used). One may argue that in many ways, an SMS interface is similar to a command-line interface – with no menus, forms or buttons to help the user to understand or remember its affordances. There have also been some issues with regard to interconnectivity between mobile providers. Nevertheless, since 2003, most mobile phone users can text other mobile phone users worldwide irrespective of their mobile provider (Potter, 2006).

Based on these limitations of the technology, one would have predicted an ease of use issue. However, in reality, SMS has been adopted by many users and has in fact, become extremely popular. Despite their limitations, mobile devices (especially mobile phones) have become a natural part of the everyday lives of a huge number of people (especially the younger generations growing up with computing and internet technologies) and the increasing range of services based on mobile applications is growing.

With more generation Xs and Ys using library services, SMS technology could become the preferred medium of choice, whether for communications (e.g. reminder services), reference services or other services such as catalogue searching. For academic libraries in particular, SMS technology should be seriously considered as the majority of students are in the age group that have high usage of mobile technologies. The challenge will be to determine the nature of services the library should deliver via SMS and to come up with solutions to the various challenges mobile phone technology currently present to ensure satisfactory services to its customers.

Mutula (2002) has reported that while there is a great deal of information on the potential use of mobile phones for internet access via the emerging wireless application protocol technology, little information if any, exists about the link between mobile phones and library services. The main objective of this study is to investigate the viability of using SMS for library catalogue searching, bearing in mind that this service could be expanded to include federated searching through Proquest, ScienceDirect and ERIC among others.

## 2. Literature review

### 2.1 A brief look at the SMS technology and SMS-based services

The growing popularity of mobile phone use in the society is obvious. Initially perceived to be the technology of the rich (“The yuppie phone”), the proliferation of mobile phone providers coupled with the developments in technology, especially pre-pay services, has meant that mobile phones have become more affordable to all in society, rich or poor (Grinter and Eldridge, 2003).

According to Smoreda and Thomas (2001), SMS is used primarily by younger people (generation Xs and Ys) of both genders, with the average age of SMS users of 30 years of age. The main reasons teenagers in particular chose text messaging over other media were because it was quicker, cheaper and more convenient. Affordable cost, the asynchronous nature of use (i.e. users can reflect before sending and reply at their leisure) and the potential for private/quiet use are also thought to be reasons for its growing popularity (Markett *et al.*, 2004).

Text messaging has shifted from being a “one-to-one” to a “one-to-many” communications tool. There are various technologies that offer this service, ranging from standalone SMS texting systems to component systems that integrate SMS functionality into existing systems and other applications (Riordan and Traxler, 2005). Vodafone UK for instance, has recently developed the Vodafone Text Centre service ([www.vodafone.co.uk/textcentre](http://www.vodafone.co.uk/textcentre)), which allows text messages to be sent to single recipients or to a broader distribution list from their customer’s email programmes.

In summary, text messaging offers a cost effective, efficient and convenient way for communicating. Used correctly, SMS technology can offer immediate response, more engagement and interaction. Texting has become a form of mass communication in many countries (Rheingold, 2002). A mobile culture is developing on which users typically have mobiles at hand or in-the-pocket the majority of the time. It is perhaps time for libraries to explore whether this mobile culture is something that can be tapped into for potential value-added services.

## *2.2 Applications within the library sector*

SMS technology and its application within libraries is a little explored phenomenon. One institution that has conducted a trial of this service is the Library and Information Service at Curtin University in Adelaide, Australia. A pilot study, “SMS a Query” commenced in 2004. Text messages sent to Curtin Library arrive in the form of an email and are replied to via email through a workstation. All outgoing messages are prefaced with “Curtin Library” to indicate to the client who the message is from. The service can send up to three concatenated text messages, giving staff up to approximately 440 characters to use. Set up costs were approximately AU\$1,000 for the infrastructure, a monthly maintenance fee of AU\$30 and the additional cost of outgoing messages at 22 cents per message (Giles and Grey-Smith, 2005). Using bulk SMS services, the cost per message could be reduced further.

The study found that over a period of six months, more than 200 queries were received. Seventy-one per cent were explanatory queries, 10 per cent were regarding the catalogue, 9 per cent were reference queries, 8 per cent required a referral and 2 per cent per technical. Only 13 per cent of the messages required two or more concatenated messages. The average turnaround in response time was 74 minutes. Feedback from clients in the form of surveys was positive. The service was easy to use (rating of 4.2 out of 5), 100 per cent of the clients experienced no problems using the service and 92 per cent responded that they would use the service again. The pilot study was perceived to be a success and in 2005, the service was incorporated into the library’s online query service. One of the major concerns that came out from this pilot study at Curtin was that with the use of SMS, no face-to-face reference interview process was taking place; clients were limited to 160 characters to express their query; and library staff had to work with the limited number of characters in their response.

Giles and Grey-Smith (2005) did warn that an SMS service may not be appropriate for all libraries. The need to evaluate the needs of your customers is essential. Do your users want to be contacted by SMS text? If so, what do they want to be contacted about? Are library notifications such as overdue, recall and reserve notices sufficient? Or do they prefer to have a full reference service by SMS on par with virtual reference or instant messaging reference services? All of these questions should be explored and investigated before any investment in SMS technology takes place.

Another example of application is "Reference by SMS" that was developed by the Altarama Systems & Services which allows library clients to submit questions to the library and for libraries to respond to the client's mobile phone with an SMS (text) message, all managed through the library's existing email handling procedures ([www.altarama.com.au/refxms.htm](http://www.altarama.com.au/refxms.htm)).

Apart from its use in reference services, SMS broadcasts could be made to target groups to promote services such as tours and tutorials, new databases, new books or extended library hours. Appointment reminders could be sent out to individuals or groups of people who may have booked specialised library instruction, rooms and/or equipment. SMS technology can also be used in library instruction programmes where short questions could be posted to the librarian or instructor who could in turn display responses to the whole class.

Innovative's Millennium ([www.iii.com/mill/index.shtml](http://www.iii.com/mill/index.shtml)), Talis Message (<https://ulib.derby.ac.uk/library/message.html>) and Civica's Spydus ([www.civicapl.com/NR/rdonlyres/B82F7079-1B77-4D3F-A658-90A9069C996B/472/SPYDUSbrochure.pdf](http://www.civicapl.com/NR/rdonlyres/B82F7079-1B77-4D3F-A658-90A9069C996B/472/SPYDUSbrochure.pdf)) are some other library systems which offer SMS functionality that can be purchased as an additional module of an existing library management system.

### 3. The preliminary assessment

Given the potential of SMS-based technology to enhance library services to their users, it is worthwhile investigating the adoption of this technology. The current study aims to investigate the effects of perceived self-efficacy (SE), perceived usefulness (PU), perceived ease of use (PEOU) and intention to use (IU) a proposed SMS-based library catalogue system. Data will be collected via a survey of a purposeful and convenient sample. A low-fidelity prototype of the SMS-based library catalogue search system (in the form of a series of mock-up screens of how the system works) was developed for this purpose (more details in Section 4).

Traditionally, library catalogues have been searched through card catalogues, then through OPACs. An investigation into the PU, PEOU and the participants' perceived SE will be important as this proposed system requires users to adjust their conceptual model of OPAC or web-based OPAC search (and retrieval) previously done via library terminals or their own workstations or laptops.

Some studies have looked at the issue of mobility in the dynamic environment/field context (Mihalic *et al.*, 2005; Gorlenko and Merrick, 2003), highlighting the importance of paying attention to, for instance, the presence of other devices or objects of interest in the users' environment. This will no doubt be important. However, this is beyond the scope of the current study. The focus of this study is to ask potential users basic questions about their perception of such a system – whether it is viable and if it is a potentially useful system.

4. The SMS-based library catalogue search system description

The SMS search system is activated through SMS codes send from a user’s mobile phone. The current prototype system is a three-tier system as shown in Figure 1. Tier 1 consists of the user’s device and wireless network. Tier 2 consists of an SMS interface and the internet agent. Tier 3 consists of the search engines and the database content (in this case, the library OPACs). When a user inputs a search keyword to the system, the message is routed through the carrier SMS centre (SMSC). The SMSC identifies the recipient number and passes the message to the recipient. Upon receiving the SMS message, which includes the input (search) keywords, the SMS interface software parses the message and activates the internet agent to set off the OPAC search. The internet agent can activate several different search engines that are available. Once the search has been completed, the result is returned to the sender in the form of either a SMS message or an e-mail. Alternatively, if the internet server is connected to SMSC via TCP/IP, then upon receiving the search keywords from a user, the SMSC passes this information to the internet server and subsequently activates the internet agent to perform the search. The result is returned to the SMSC to be forwarded to the sender’s mobile unit or sent as an e-mail. In the long run, a direct connection between SMSC and internet server is preferred. However, this would require the purchase of a SMSC account service with a carrier or a third party SMS service provider.

A series of screen shots of the prototype system is depicted in Figure 2 to show what will be displayed to the users via a mobile phone (or other type of mobile devices).

5. Research model and hypothesis

The research model tested in this study is depicted in Figure 3. The model was derived from previous research that examines the impact of SE and cognitive beliefs on technology adoption of e-library technology among students in a Malaysian University (Ramayah and Aafaqi, 2004).

The current research uses the technology acceptance model (TAM) as the basic framework but extends it by including the construct of SE. Given the popularity of the SMS technology, there are surprisingly few studies that have applied TAM to basic SMS usage and SMS-based systems. The current research thus intends to extend understanding of the adoption of SMS-based systems. TAM has been used in a wide

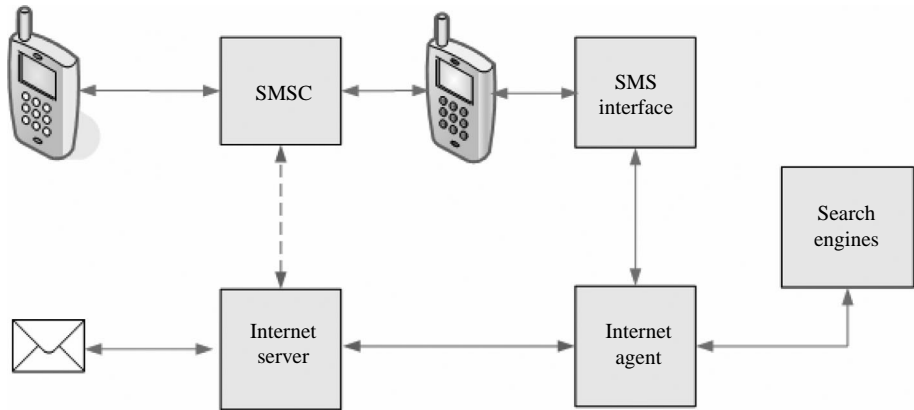


Figure 1.  
SMS-based library  
catalogue system



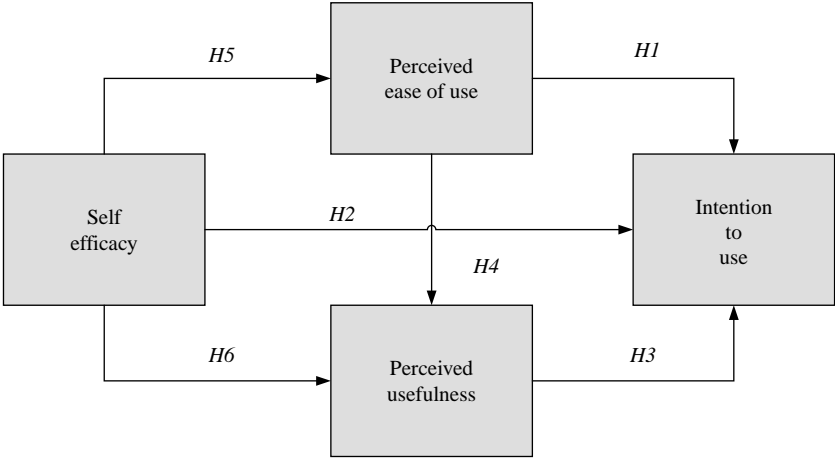


**Figure 2.**  
Simulated screen shots

range of technologies and system applications to predict acceptance (Venkatesh *et al.*, 2002). A good summary of the TAM model in various domains can be found in Lee *et al.* (2007).

Table I summarises recent research on adoption models applied on examining the adoption of SMS and multimedia message services. It can be observed that when TAM





**Figure 3.**  
Research model tested

Author (year)	Topic	Participants	Model	$R^2$
Lee <i>et al.</i> (2007)	Multimedia message services	207 students	TAM + perceived enjoyment + perceived media richness	0.65 IU
Park and Chen (2007)	Innovative use of smartphone	133 doctors and nurses	TAM + innovative diffusion theory + SE	0.649 PU → Behavioral Intention to use 0.41
Turel <i>et al.</i> (2007)	SMS	222 students	PQV + perceived emotional value + PVFM + perceived social value	0.61 IU
Pedersen (2006)	Short message parking service	459 consumers	Theory of planned behaviour	0.55 IU
Mallat <i>et al.</i> (2006)	SMS ticketing service	360 consumers	TAM + compatibility + mobility + use situation	0.49 TAM variables
Dennis and Venkatesh (2003)	SMS for collaboration	111 students	TAM + technology characteristics + individual and group characteristics + task characteristics + situational characteristics	0.22 IU
Tung (2004)	SMS	150 consumers	SQ + perceived value + customer satisfaction	

**Table I.**  
Use of adoption models in recent research on SMS and multimedia message services

is adopted, the variance explaining power ( $R^2$ ) is much stronger with respect to the IU the technology. On the other hand, other models such as the performance quality value (PQV) model (Turel *et al.*, 2007) and service quality (SQ) model (Tung, 2004) appear to have a weaker explanation power.

The current study's research model includes the SE construct and hypothesizes that SE has a positive direct influence on IU as reported in a number of previous studies (Park and Chen, 2007; Gong *et al.*, 2004; Kishore *et al.*, 2001). The hypotheses tested in this study are:

- 
- H1.* PEOU will have a positive impact on IU.
  - H2.* SE will have a positive impact on IU.
  - H3.* PU will have a positive impact on IU.
  - H4.* PEOU will have a positive impact on PU.
  - H5.* SE has an influence on PEOU.
  - H6.* SE has an influence on PU.

## 6. Methodology

### 6.1 Study context and sample

The target respondents of this study were university students who had experience in using the university's OPAC. Table II summarises the background information of the participants. A quantitative approach was taken and a survey questionnaire was the data collection instrument for this study. Prior to data collection, a series of mock-up screens as shown in Figure 2 was displayed and the functions and feature of the system were explained to the students. A total of 112 survey questionnaires out of the 130 distributed were received, out of which nine were incomplete and were therefore excluded from the final analysis. Therefore, a total of 103 questionnaires (92 per cent of the samples) were analysed. All returned questionnaires were manually checked to ensure there were no missing or ambiguous answers.

### 6.2 Questionnaire design

The questionnaire consisted of four parts. The first part was comprised of demographic questions. The second part focused on the cognitive beliefs constructs, PU and PEOU. Under PU, six statements were presented and respondents were asked to rate them from 1 (very unlikely) to 7 (very likely) to investigate whether they perceived the proposed system to be useful. Another six statements were presented for PEOU of the proposed system and again, respondents were asked to rate them from 1 (very unlikely) to 7 (very likely). These statements were adapted from Davis (1989) and were to serve as an initial stimulus.

The third part of the questionnaire investigates the perceived SE of the respondents towards the proposed system. This part of the questionnaire was based on Compeau and Higgins's (1995) work on computer SE that examines one's perceived ability to use an unfamiliar piece of software. Ten statements/conditions were included in this part of the questionnaire to solicit respondents' perception of whether they could use the proposed system under a variety of conditions. For each of the conditions, respondents were asked to indicate whether they thought they would be able to complete their task using the proposed system, and for each of the conditions for which they answered "yes", they were asked to rate their confidence on their original judgement by selecting a number from 1 (not at all confident) to 7 (totally confident). Finally, part IV of the questionnaire investigates the participants' IU of the proposed system.

## 7. Findings and analysis

The samples consisted of more male (63 per cent) than female (37 per cent) participants. A total of 87.3 per cent of the respondents were from the 16-25 age group. A total of

TEL  
27,3

402

Variables	Frequency	%
<i>Gender</i>	<i>N</i> = 103	
Male	65	63.1
Female	38	36.9
<i>Age</i>	<i>N</i> = 102	
16-20	67	65.0
21-25	23	22.3
26-30	8	7.8
31-35	1	1.0
36-40	1	1.0
> 40	2	1.9
<i>Year in university</i>	<i>N</i> = 102	
1st	64	62.1
2nd	26	25.2
3rd	6	5.8
4th	3	2.9
5th	2	1.9
> 5th	1	1.0
<i>OPAC experience</i>	<i>N</i> = 102	
> 2 years	27	26.2
1-2 years	25	24.3
< 1 year	50	48.5
<i>Mobile phone user</i>	<i>N</i> = 102	
Never	1	1.0
1-2 years	2	1.9
2-4 years	23	22.3
4-6 years	32	31.1
> 6 years	44	42.7
<i>SMS usage</i>	<i>N</i> = 103	
Never	3	2.9
< 5 msg/day	13	12.6
5-10 msg/day	32	31.1
> 10 msg/day	55	53.4
<i>SMS skill</i>	<i>N</i> = 103	
Novice	3	2.9
> Novice	1	1.0
< Intermediate	4	3.9
Intermediate	21	20.4
> Intermediate	15	14.6
< Proficient	25	24.3
Proficient	33	32

**Table II.**  
Participants background  
information

87.3 per cent were first and second year students. Except for one participant, all the other participants have used a mobile phone and 97 per cent have used SMS. A total of 91.3 per cent of the participants believe their texting skill is at the level of intermediate or at a higher level.

Internal reliability is validated through Cronbach's  $\alpha$ . Cronbach's coefficient  $\alpha$  in Table III shows that the internal reliabilities of the constructs were all greater than 0.8; a value of greater than 0.7 or higher is normally consider acceptable (Hair *et al.*, 1998).

Construct validity examines whether the measurement scales represent and act like the attributes being measured. Principle components factor analysis with Varimax

rotation was used to measure the construct validity. Table IV shows that there are four factors. SE1 and SE2 together form a separate factor. These two items were subsequently removed from the analysis and we retained SE3-SE10 as the SE factor. All the loadings were greater than 0.6, indicating strong loading on the factors determined through eigenvalue that is greater than 1.0 criterion. The first three factors captured 70.6 per cent of the total variance.

Discriminant validity is demonstrated if the measure is not a mirror of other variables. Table V shows the inter-correlation (off diagonal elements) between the constructs and the square roots of the average variance extracted (diagonal elements). The square roots of the average variance extracted were all greater than their shared variances. This confirms discriminant validity of the constructs (Fornell and Larcker, 1981, p. 46). Interestingly, SE shows a negative but small and insignificant correlation

Factors	Items	Cronbach's $\alpha$
PEOU	6	0.933
PU	6	0.905
SE	10	0.930
IU	2	0.876

**Table III.**  
Cronbach's  $\alpha$

Item	Factor 1 SE-E	Factor 2 PU	Factor 3 PEOU	Factor 4 SE-I
PU1	0.064	0.885	0.240	0.077
PU2	-0.116	0.893	0.097	0.094
PU3	-0.082	0.886	0.085	-0.001
PU4	-0.138	0.862	0.155	0.161
PU5	0.117	0.735	0.248	-0.111
PU6	-0.033	0.868	0.119	-0.039
PEOU1	0.373	0.059	0.692	0.142
PEOU2	0.208	0.201	0.807	0.163
PEOU3	0.287	0.270	0.764	-0.018
PEOU4	-0.003	0.396	0.672	0.189
PEOU5	0.278	0.051	0.784	0.167
PEOU6	0.224	0.272	0.836	0.067
SE1	0.489	0.059	0.159	0.681
SE2	0.240	0.107	0.278	0.793
SE3	0.783	-0.109	0.300	0.210
SE4	0.802	-0.001	0.164	0.058
SE5	0.817	-0.029	0.084	0.099
SE6	0.870	0.014	0.086	-0.016
SE7	0.841	-0.093	0.224	0.293
SE8	0.673	-0.052	0.323	0.417
SE9	0.860	0.019	0.268	0.063
SE10	0.824	-0.037	0.207	0.130
Total eigenvalue	8.598	5.269	1.680	1.008
Percentage of variance	39.080	23.952	7.634	4.582
Cumulative percentage	39.080	63.032	70.666	75.248

**Table IV.**  
Principal component  
analysis with Varimax  
rotation

TEL  
27,3

404

between IU and PU. A negative relationship between SE and other TAM factors have previously been reported in Hasan (2006), Hasan and Ali (2006) and Chau (2001).

Regression analysis is performed to test the proposed hypotheses. Table VI and Figure 4 show that *H1*, *H3*, *H4* and *H5* were supported but not *H2*. SE in this case has a small and insignificant negative direct impact on IU. The  $\beta$  value is  $-0.124$ . In addition, SE has a significant but negative effect on PU. The selected construct for SE

**Table V.**  
Correlation between  
factors

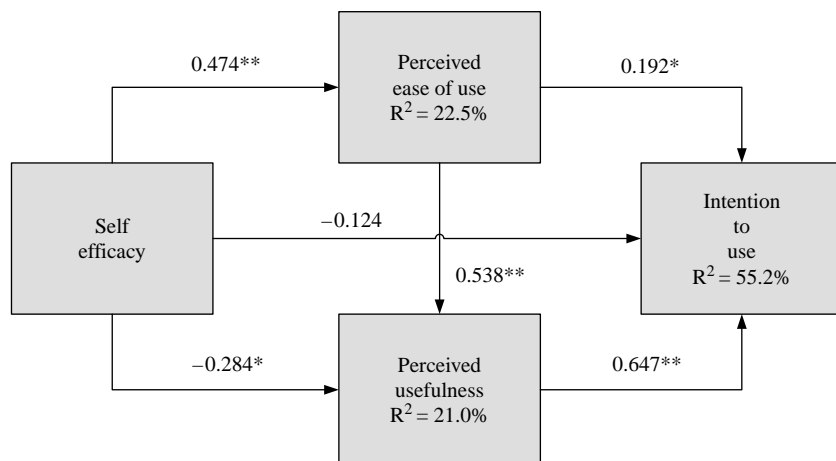
Variables	Mean	SD	IU	SE	PU	PEU
IU	4.29	1.58	0.94			
SE	5.20	1.13	$-0.028$	0.81		
PU	4.40	1.34	$0.732^a$	$-0.017$	0.86	
PEOU	5.28	1.02	$0.376^a$	$0.509^a$	$0.399^a$	0.76

**Notes:** <sup>a</sup>Pearson correlation is significant at the 0.01 level (one-tailed); diagonal elements are average variance extract

**Table VI.**  
Regression analysis

Regression equation	Adjusted $R^2 =$	$\beta$	$t$ -value	Significant	Hypothesis
SE $\rightarrow$ PEOU	0.225				
SE		$0.474^{***}$	5.491	0.000	<i>H5</i> (supported)
SE + PEOU $\rightarrow$ PU	0.210				
SE		$-0.284^{**}$	$-2.883$	0.005	<i>H6</i> (supported)
PEU		$0.538^{***}$	5.460	0.000	<i>H4</i> (supported)
SE + PEOU + PU $\rightarrow$ IU	0.552				
SE		$-0.124$	$-1.576$	0.118	<i>H2</i> (not supported)
PEOU		$0.192^*$	2.233	0.028	<i>H1</i> (supported)
PU		$0.647^{***}$	8.584	0.000	<i>H3</i> (supported)

**Notes:** Standardised  $\beta$ s are reported  $^*p < 0.05$ ;  $^{**}p < 0.01$ ;  $^{***}p < 0.001$



**Figure 4.**  
The regression model

**Note:** Standardised  $\beta$ s are reported  $^*P < 0.01$ ;  $^{**}P < 0.001$

may have resulted in users not appreciating the usefulness of the proposed system. As in most TAM model, PEOU and PU have direct significant impact on IU. Similarly, PEOU has a direct significant impact on PU. Likewise, SE has a significant direct impact on PEOU. Overall, a strong 55.2 per cent of the variance can be explained with respect to IU the proposed system.

## 8. Discussion

Overall, the model explained 55.2 per cent of the variance in IU. Thus, the results show that the SE-TAM does explain the adoption of the proposed system satisfactorily. For the proposed system, PU has the strongest impact over IU. PEOU has a smaller impact on IU but it has a very strong indirect impact on IU through PU. A user who finds the system easy to operate and useful is likely to adopt the system. Interestingly, the SE factor has a negative relationship with PU. One possible explanation is that the system is perceived to be very straightforward for experienced SMS users. Further external help as worded in the SE construct may result in users not appreciating the usefulness of the system. Also experiences SMS users may see some limitations of the proposed system compare to inexperienced SMS users. Another factor may be the fact that most of the experienced SMS users had little experience using the library OPAC and therefore, they could not appreciate the usefulness of the system even though they might think that there were able to operate the system easily. A third reason may be that users did not actually get a chance to use the proposed system; they were only shown a sequence of screen shots on how the system operates. Using screen shots instead of the actual use of the system is likely to have had an influence on their perception of the usefulness of the system.

## 9. Conclusions and further research

This paper has presented some insights on user technology constructs – PU and PEOU, as well as IU and SE constructs as related to the adoption and use of a proposed SMS-based library catalogue system. Continued research, development and evaluation is required to provide better understanding of all the possible factors that may have an impact on the acceptance of the proposed system and to provide useful guidelines for developers and designers.

The current study has a number of limitations which could be addressed by further research. First of all, the current study uses mock-ups – a higher fidelity prototype or an actual system would be desirable in future studies. Second, the SE constructs can be separated into internal SE and external SE, which may result in different findings (Thatcher *et al.*, 2007). The investigation reported in this paper is biased toward external SE. It would be desirable to distinguish these constructs and to examine their impact on the proposed model. It is also important to recognise that SMS usage may be affected by a number of social factors such as situational factor, mobility factor and the perceived value for money (PVFM). These factors should be included in future model for a more holistic understanding of the adoption of the proposed system (Mallat *et al.*, 2006).

Also, a number of earlier studies on mobile learning have found that mobile device users valued efficiency and availability as the main advantages (Chen *et al.*, 2003; Hill and Roldan, 2005; Ting, 2005). Hence, the perceived mobility value could be investigated as a possible factor affecting user's acceptance of the proposed system.

Gender differences may also have an impact on the acceptance of this technology. Males and females appreciate technology differently (Hartzel, 2003; Gefen and Straub, 1997). It would be interesting to investigate the model with respect to this factor. Similarly, age may be an influencing factor on technology acceptance and on these constructs (McCloskey, 2006). The current data set is biased toward a younger population and it would be interesting to see if there is a significant difference among age groups.

## References

- Buchanan, G., Jones, M., Thimbleby, H., Farrant, S. and Pazzani, M. (2001), "Improving mobile internet usability", *Proceedings of 10th Internet/WWW Conference, May, World Wide Web*, pp. 673-80.
- Chau, P.Y.K. (2001), "Influence of computer attitude and self-efficacy on IT usage behaviour", *Journal of End User Computing*, Vol. 13 No. 1, pp. 26-33.
- Chen, Y.S., Kao, T.C. and Sheu, J.P. (2003), "A mobile learning system for scaffolding bird watching learning", *Journal of Computer Assisted Learning*, Vol. 19 No. 3, pp. 347-59.
- Compeau, D.R. and Higgins, C.A. (1995), "Computer self-efficacy: development of a measure and initial test", *MIS Quarterly*, Vol. 19 No. 2, pp. 189-211.
- Davis, F.D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *MIS Quarterly*, Vol. 13 No. 3, pp. 319-40.
- Dennis, A.R., Venkatesh, V. and Ramesh, V. (2003), *Adoption of Collaboration Technologies: Integrating Technology Acceptance and Collaboration Technologies Research*, available at: [www.indiana.edu/isdept/research](http://www.indiana.edu/isdept/research)
- Downer, S.R., Meara, J.G. and Annette, C. (2005), "Use of SMS text messaging to improve outpatient attendance", *Medical Journal of Australia*, Vol. 183 No. 7, pp. 366-8.
- Ericsson, T., Chincholle, D. and Goldstein, M. (2001), "Both the cellular phone and the service impact WAP usability", *Joint Proceedings of IHM 2001 and HCI 2001, September, Lille*, pp. 79-85.
- Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18, pp. 39-50.
- Gefen, D. and Straub, D.W. (1997), "Gender differences in the perception and use of e-mail: an extension to the technology acceptance model", *MIS Quarterly*, Vol. 21 No. 4, p. 389.
- Giles, N. and Grey-Smith, S. (2005), "TXTing librarians@Curtin", Information Online 2005, available at: <http://conferences.alia.org.au/online2005/papers/a12.pdf>
- Gong, M., Xu, Y. and Yu, Y. (2004), "An enhanced technology acceptance model for web-based learning", *Journal of Information Systems Education*, Vol. 15 No. 4, pp. 365-73.
- Gorlenko, L. and Merrick, R. (2003), "No wires attached: usability challenges in the connected mobile world", *IBM Systems Journal*, Vol. 42 No. 4, pp. 639-51.
- Grinter, R. and Eldridge, M. (2003), "Wan2tlk?: everyday text messaging", paper presented at the Conference on Human Factors in Computing Systems, Fort Lauderdale, FL.
- Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C. (1998), *Multivariate Data Analysis*, 5th ed., Prentice-Hall, Englewood Cliffs, NJ.
- Hartzel, K. (2003), "How self-efficacy and gender issues affect software adoption and use", *Communications of the ACM*, Vol. 46 No. 9, pp. 167-71.
- Hasan, B. (2006), "Delineating the effects of general and system-specific computer self-efficacy beliefs on IS acceptance", *Information and Management*, Vol. 43 No. 5, pp. 565-71.



- Hasan, B. and Ali, J. (2006), "The impact of general and system-specific self-efficacy on computer training learning and reactions", *Academy of Information and Management Sciences Journal*, Vol. 9 No. 1, pp. 17-35.
- Hill, T.R. and Roldan, M. (2005), "Toward third generation threaded discussions for mobile learning: opportunities and challenges for ubiquitous collaborative environments", *Information Systems Frontiers*, Vol. 7 No. 1, pp. 55-70.
- Kishore, R., Lee, J. and McLean, E.R. (2001), "The role of personal innovativeness and self-efficacy in information technology acceptance: an extension of tam with notions of risk", *Proceedings of the International Conference on Information Systems, ICIS 2001, 16-19 December, New Orleans, LA*.
- Lai, T.L. (2004), "Service quality and perceived value's impact on satisfaction, intention and usage of short message service (SMS)", *Information Systems Frontiers*, Vol. 6 No. 4, pp. 353-68.
- Lee, M.O.K., Cheung, C.D.M. and Chen, Z. (2007), "Understanding user acceptance of multimedia messaging services: an empirical study", *Journal of the American Society for Information Science and Technology*, Vol. 58 No. 13, pp. 2066-77.
- McCloskey, D.W. (2006), "The importance of ease of use, usefulness, and trust to online consumers: an examination of the technology acceptance model with older consumers", *Journal of Organizational and End User Computing*, Vol. 18 No. 3, pp. 47-65.
- Mallat, N., Rossi, M., Tuunainen, V.K. and Öörni, A. (2006), "The impact of use situation and mobility on the acceptance of mobile ticketing services", *Proceedings of the 39th Hawaii International Conference on System Sciences*, IEEE Computer Society Press, New York, NY.
- Markett, C., Arnedillo Sánchez, I., Weber, S. and Tangney, B. (2004), "Pls turn ur mobile on: short message service (SMS) supporting interactivity in the classroom", in Kinshuk, D.G., Sampson and Isaías, P. (Eds), *Cognition and Exploratory Learning in Digital Age*, International Association for Development of the Information Society Press, Lisbon, pp. 475-8.
- Mihalic, K., Reitberger, W., Obermair, C. and Tscheligi, M. (2005), "Context in mobile HCI", *Proceedings of the 7th International Conference on Human Computer Interaction With Mobile Devices and Services, 19-22 September, Salzburg*, MobileHCI '05, Vol. 111, ACM Press, New York, NY, pp. 355-6.
- Mutula, S.M. (2002), "The digital divide in sub-Saharan Africa: implications for the revitalisation and preservation of indigenous knowledge systems", in Snyman, R. (Ed.), *SCECSAL 2002: From Africa to the World – The Globalisation of Indigenous Knowledge Systems, Proceedings of the 15th Standing Conference of Eastern, Central and Southern African Library and Information Associations, 15-19 April, Caesars Gauteng Conference Centre*, Library and Information Association, Pretoria, pp. 119-41.
- Park, Y. and Chen, J.V. (2007), "Acceptance and adoption of the innovative use of smartphone", *Industrial Management and Data Systems*, Vol. 107 No. 9, pp. 1349-65.
- Pedersen, P.E. (2003), "Modifying adoption research for mobile internet service adoption: cross-disciplinary interaction", *Proceedings of the 36th Annual Hawaii International Conference on System Sciences, January 6-9, Maui, HI*.
- Pedersen, P.E. (2006), "Instrumentality challenged: the adoption of a mobile parking service", in Ling, R. and Pedersen, P.E. (Eds), *Mobile Communications: Re-negotiation of the Social Sphere*, Springer-Verlag, London.
- Potter, B. (2006), "Msg cmng thru loud n clr", *Denver Post*, March 5, K.01.

- Ramayah, T. and Aafaqi, B. (2004), "Role of self-efficacy in e-library usage among students of a public university in Malaysia", *Malaysian Journal of Library and Information Science*, Vol. 9 No. 1, pp. 39-57.
- Rheingold, H. (2002), "A conversation with Howard rheingold", in Powazek, D.M. (Ed.), *Design for Community: the Art of Connecting Real People in Virtual Places*, New Riders, Indianapolis, IN, pp. 286-96.
- Riordan, B. and Traxler, J. (2005), "The use of targeted bulk SMS texting to enhance student support, inclusion and retention", paper presented at the IEEE International Workshop on Wireless and Mobile Technologies in Education (WMTE'05).
- Smoreda, Z. and Thomas, F. (2001), "Social networks and residential ICT adoption and use", available at: [www.eurescom.de/ftp/root/web-deliverables/public/P900-eries/P903/ICT\\_use\\_Smoreda.pdf](http://www.eurescom.de/ftp/root/web-deliverables/public/P900-eries/P903/ICT_use_Smoreda.pdf)
- Thatcher, J.B., McKnight, D.H., Gundlach, M.J. and Zimmer, C. (2007), "Individual and human-assisted computer self-efficacy: an empirical examination", *IEEE Transactions on Engineering Management* (forthcoming).
- Ting, R.Y.L. (2005), "Mobile learning: current trend and future challenges", *Proceedings of 5th IEEE International Conference on Advanced Learning Technologies, ICALT 2005*, 5-8 July, IEEE Computer Society, Kaohsiung.
- Tung, L.L. (2004), "Service quality and perceived value's impact on satisfaction intention and usage of short message service (SMS)", *Information Systems Frontiers*, Vol. 6 No. 4r, pp. 353-68.
- Turel, O., Serenko, A. and Bontis, N. (2007), "User acceptance of wireless short messaging services: deconstructing perceived value", *Information Manage*, Vol. 44 No. 1, pp. 63-73.
- Venkatesh, V., Speier, C. and Morris, M.G. (2002), "User acceptance enablers in individual decision making about technology: toward an integrated model", *Decision Sciences*, Vol. 33 No. 2, pp. 297-316.

### About the authors

Tiong T. Goh is a Lecturer in the School of Information Management at Victoria University of Wellington. His research areas include mobile learning, mobile games for education and mobile database applications and development.

Chern Li Liew is a Senior Lecturer in the School of Information Management at Victoria University of Wellington. She holds a PhD in Information Studies from the Nanyang Technological University of Singapore and a MSc from Loughborough University. She has published in the areas of digital libraries and resources, electronic documents, online cultural heritage and knowledge classification and representation in a variety of international refereed journals. She is on the Editorial Advisory Boards of *Library and Information Science Research* and *Online Information Review*. Chern Li Liew is the corresponding author and can be contacted at: [chernli.liew@vuw.ac.nz](mailto:chernli.liew@vuw.ac.nz)

**This article has been cited by:**

1. Wei-Wen Wu, Lawrence W. Lan, Yu-Ting Lee. 2013. Factors hindering acceptance of using cloud services in university: a case study. *The Electronic Library* 31:1, 84-98. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]
2. Sridevi Jetty, John Paul Anbu K.. 2013. SMS-based content alert system: a case with Bundelkhand University Library, Jhansi. *New Library World* 114:1/2, 20-31. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]
3. Dion Hoe-Lian Goh, Chei Sian Lee, Guanghao Low. 2012. "I played games as there was nothing else to do". *Online Information Review* 36:6, 784-806. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]
4. Huiying Du, Ge Zhu, Limin Zhao, Tingjie Lv. 2012. An empirical study of consumer adoption on 3G value-added services in China. *Nankai Business Review International* 3:3, 257-283. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]
5. Boon-Chong Seet, Tiong-Thye Goh. 2012. Exploring the affordance and acceptance of an e-reader device as a collaborative learning system. *The Electronic Library* 30:4, 516-542. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]
6. John Paul Anbu K., Makana R. Mavuso. 2012. Old wine in new wine skin: marketing library services through SMS-based alert service. *Library Hi Tech* 30:2, 310-320. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]
7. Jung-Jung Chang, Chyan Yang. 2012. Viable or vital? Evaluation of IM services from patrons' perspectives. *The Electronic Library* 30:1, 70-88. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]
8. Robert Tomaszewski. 2011. SMS Text Messaging and Science Students: New Opportunities for Librarian Outreach. *Science & Technology Libraries* 30, 277-291. [[CrossRef](#)]
9. Hanho Jeong. 2011. An investigation of user perceptions and behavioral intentions towards the e-library. *Library Collections, Acquisitions, and Technical Services* 35, 45-60. [[CrossRef](#)]
10. Georgina Parsons. 2010. Information provision for HE distance learners using mobile devices. *The Electronic Library* 28:2, 231-244. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]