Factors affecting faculty use of learning object repositories

Hong Xu

Department of Research, Commercialization, and Outreach, Texas A&M University, Corpus Christi, Texas, USA

Received 11 July 2014
Revised 2 October 2014
Accepted 21 November 2014

Abstract

Purpose – The purpose of this study was to identify factors that motivate or impede faculty use of learning object repositories (LORs). The unified theory of acceptance and use of technology (UTAUT) served as the theoretical framework for this study.

Design/methodology/approach – The study used both quantitative and qualitative approaches to explore two research questions relating to factors affecting faculty use of LORs. Research subjects were faculty users in two- or four-year colleges or universities from two LORs: Orange Grove and Wisconsin Online Resource Center (Wisc-Online). Two phases of the study were conducted. Phase I of the study collected data by semi-structured interviews, and data were analyzed by a content analysis method. Based on the results of Phase I, Phase II collected data by a survey instrument, and data were analyzed by descriptive statistics and analysis of variance.

Findings – The study identified 22 factors as motivators for faculty use of LORs and 13 factors as barriers for faculty use of LORs.

Research limitations/implications – The research policies of Orange Grove and Wisc-Online limited the selection of study participants. Lack of a random sample and a small sample size limited the generalizability of the results and findings of the study. However, as an exploratory research, the results and findings of the study are still valuable for LOR builders and managers to get a better understanding of factors affecting faculty use of LORs, and to develop strategies to recruit more faculty members to use LORs.

Practical implications – The findings and results of the study can inform designers and managers of LORs about what positively or negatively influences faculty use of LORs, and serve as a basis to develop strategies to recruit faculty members to use LORs.

Originality/value – First, this study identified the factors that motivate or impede faculty use of LORs from actual faculty users' perspectives, so these factors more accurately reflect LORs' values to faculty in teaching and course design and the barriers for faculty use of LORs in a practical environment. Second, this study is among the first known to explore these factors using UTAUT as the theoretical framework, and the results of the study also validate UTAUT in the context of faculty use of LORs.

Keywords Digital libraries, Course design, Learning object repositories, Learning objects

Paper type Research paper

Introduction

Although faculty may not be familiar with the term learning object (LO), they may have already used these in their instruction and course designing. An LO is defined as "any digital resource that can be reused to support learning" (Wiley, 2000, p. 7). Educators have a long history of sharing and reusing learning resources in the form of textbooks, and conference and peer-reviewed journal papers; LOs can be shared and reused also (Campbell, 2003; Maloney *et al.*, 2013; Pras, 2001). The LO is only one type of learning

The Electronic Library
Vol. 33 No. 6, 2015
pp. 1065-1078

0264-0473
DOI 10.1108/EL-07-2014-0108

resource. The LO may serve as the basic building block of instructional materials and contributes to the improvement of education in both online and classroom environments.

A learning object repository (LOR) is a digital collection of LOs. The repository stores, manages and makes accessible LOs and any associated metadata. Normally, an LOR has a well-designed architecture and user-friendly interface that provides or supports various functions, such as access control, search, browse, submission, preservation, downloading and digital rights management (George Mason University, 2003; Matkin, 2002). The goal of building LORs is to make the best use of LOs, to share content and good practices, to improve the effectiveness of instruction and to reduce the cost and duplication effort in instructional content development (ANTA, 2003; Goldsmith, 2007; Henderson, 2008; Matkin, 2002; MERLOT, 2008; OnCoRe Blueprint, 2008). From previous studies, however, it appears that LORs are lacking users (Bond *et al.*, 2008; Caris, 2004; Maloney *et al.*, 2013; Margaryan and Currier, 2006; Matkin, 2002; Zemsky and Massy, 2004). Consequently, many high-quality LOs in LORs are not accessed and used, and faculty members may spend time and energy creating duplicate course materials. This raises questions: What factors motivate faculty use of LORs? What factors impede faculty use of LORs? The goal of this study was to identify factors that influence (motivate or impede) faculty use of LORs from actual faculty users' perspectives. In this research, the actual users are faculty who have used or are using LORs to discover relevant LOs for possible use.

Literature review

In previous research, there are two lines of studies that relate to factors influencing faculty use of LORs. One line of research focuses on the barriers and enablers to implementing LORs, contributing LOs to LORs and using LOs from LORs and the solutions to overcome these barriers. The scope of LOR users in these studies is broad. It includes school teachers, students, amateurs, learners, managers and education institution staff. Faculty members in two- or four-year colleges or universities are not specifically investigated. From June 2005 to May 2007, the Joint Information Systems Committee sponsored a project, the Community Dimensions of LORs (CD-LOR), to identify and analyze the barriers and enablers that influence the practical uptake and implementation of LORs in different learning communities. The findings indicated that the factors fostering the use of LORs are: benefits, students' positive feedback, creating LOR user communities, promoting LORs' roles in education and functions, disseminating good practice and integrating the LOR with the existing institutional collections. The barriers in using LORs are: copyright limitation, lack of recognition, peer's negative influence, technological barriers, pedagogic issues, no institutional support and low quantity of resources (Margaryan and Currier, 2006; Margaryan *et al.*, 2006).

To define the guidelines for the development and the use of the Australian Vocational Education and Training (VET) LORs, the VET conducted a literature review and a consultation program with lecturers, content developers and VET sector managers. Following the consultation, they conducted focus group sessions, one-on-one expert consultations and online discussions in 2003. The VET research reported that the barriers for users to use the LORs are poor quality of LOs, complicated copyright procedures and expensive use fees. The VET study also developed strategies that might

draw more users to the LORs. The strategies are promotion and training, technology assistance, meeting teachers' needs, making context-neutral LOs, keeping the LOR simple and adding federal search by one interface (ANTA, 2003). Another research study pointed out that not supporting user community evaluation systems and learning management systems are key issues of LORs (Conesa *et al.*, 2012). Churchill *et al.* (2009) found that integrating users' activities, such as recommending and tagging, can increase teachers' and learners' use of LORs.

The other line of research focuses on the reasons why faculty members do not use LORs. Given the concern that LOs were not being reused to the extent hoped for, about 20 participants, including 2 two educators and 18 representatives from the e-learning industry, met in 2002 to discuss how to make LORs more useful. Matkin (2002) reported the strategies to draw more users to LORs: ensure quality control, define the intended users, foster and support user communities, clarify and reduce the restrictions of intellectual property rights, keep LOR collections dynamic, provide assistance in technologies, provide funds and budget for marketing and provide user information.

To explore the reasons why faculty members did not use LORs, Caris (2004) surveyed college directors from the faculty centers of several universities in America. The result of the survey showed that two important reasons explain why faculty do not use LORs: the inertia and ease-of-use of textbooks and publishers' materials, and the faculty's unfamiliarity with LORs. In a study, Rolfe (2012) also emphasized that faculty's lack of familiarity with LORs was a big obstacle for faculty sharing learning materials. Shea *et al.* (2006) conducted a study on the usage of the Multimedia Educational Resources for Learning and Online Teaching (MERLOT). The results indicated that the reasons for not using MERLOT were: time constraints, users simply chose not to use, excessive resources, lack of relevant content, users do not know about MERLOT, useless, users do not understand how to use MERLOT and LOs are not applicable. The other key finding from the study was that faculty members who commit to teaching online and who think students can learn more online than in a classroom were significantly more likely to use MERLOT.

Another study also found that improving student learning was the main reason for faculty to use new technologies, such as LORs, in their teaching (Waycott *et al.*, 2010). The goals of this line of research are similar to that of this study. However, the reasons found by these studies normally are too general and lack a deep understanding of the barriers for faculty use of LORs. Further research is needed to explore the factors behind these reasons. In addition, in both lines of research studies, no theoretical frameworks serve as the underpinning theory model to explore factors influencing faculty use of LORs.

These two lines of research serve as the literature foundation for this study by providing potential factors that influence faculty use of LORs. Reviewing these studies also sets the stage for the significance of conducting this study: the necessity to explore the factors influencing faculty use of LORs from the perspectives of actual faculty users and the necessity to explore these factors based on the unified theory of acceptance and use of technology (UTAUT) as a theoretical framework.

LORs are recognized as applications of information technology in the education area (Abernethy *et al.*, 2005). In the information technology area, there are several theoretical models to explain the behavior of user acceptance of new technologies. UTAUT is based on eight commonly used models. UTAUT synthesizes the constructs from these eight

models into seven dimensions, and each dimension includes several constructs. The seven dimensions are: performance expectancy, effort expectancy, social influences, facilitating conditions, attitude toward using technology, self-efficacy and anxiety. UTAUT also determines that four out of the seven dimensions (performance expectancy, effort expectancy, social influences and facilitating conditions) are key direct determinants of user acceptance and usage behavior (Venkatesh *et al.*, 2003). UTAUT was assumed to be the most appropriate framework to ensure that as many motivating and impeding factors as possible were identified. This study used UTAUT as the theoretical framework. UTAUT provided a basis for informing the interview questions and items on the survey. It provided a theoretical lens for the coding scheme that was used in the analysis of the interview data.

Research methodology

The goal of this study was to identify factors influencing faculty use of LORs. Research questions were as follows:

RQ1. What factors motivate faculty use of LORs?

RQ2. What factors impede faculty use of LORs?

The UTAUT served as the theoretical framework for the study. The study was conducted in two phases and used a mixed-method approach. The research subjects were actual faculty users in two- or four-year colleges or universities from two LORs: Orange Grove and Wisconsin Online Resource Center (Wisc-Online).

Orange Grove is an operational repository of the Florida Distance Learning Consortium. Its goal is to provide learning resources to Florida's K-20 teachers and educational institutions. It is being used by community colleges and universities in Florida. The main users are faculty, staff and administrators. Types of LOs in the LOR include: images, videos, audio clips, animations, text documents, slideshows and electronic textbooks. The resources cover a variety of subjects, such as algebra, American government, biology, calculus, environmental science, physics, psychology, statistics and history. The metadata standard of this LOR is based on the Institute of Electrical and Electronics Engineers standard for learning object metadata (IEEE LOM) and the Gateway to Educational Materials (Barnes *et al.*, 2008). The URL of the Orange Grove LOR is www.theorangegrove.org

Wisc-Online is a repository of learning resources developed primarily by faculty from the Wisconsin Technical College System (WTCS) and produced by multimedia technicians who create the LOs for the online environment. Resources are accessible to all WTCS faculty for free and with copyright clearance for use in any WTCS classroom or online application. Other colleges, universities and consortia from the USA and around the world use its LOs with permission. The LOR is housed at Fox Valley Technical College (FVTC) in Appleton, WI. Types of LOs include: assessments, animations, simulations, case studies, interactions, drills and practices and templates (Wisconsin Online Resource Center (Wisc-Online), 2007). The metadata scheme is based on the IEEE LOM. The URL of the Wisc-Online LOR is www.wisc-online.com

Phase I of the study

Phase I of the study conducted a series of semi-structured interviews. Interview questions were guided and informed by the goal of the research, UTAUT dimensions

and constructs and previous research findings discussed in the literature review. Pilot tests were conducted to test the feasibility and adequacy of interview questions. Based on the results of pilot tests, the interview protocol was revised and used in the study. The interviewees were selected based on purposeful sampling principles from faculty users of Orange Grove. From June to July 2010, the researcher conducted the 13 interviews. All the interview recordings and transcripts were stored and maintained in the database.

The study used content analysis to analyze the data gathered from the interviews. Content analysis is "a research method that uses a set of procedures to make valid inferences from text" (Weber, 1990, p. 9). This study mainly implemented qualitative operation of content analysis to code interview data (Hsieh and Shannon, 2005). By the completion of Phase I, the factors influencing faculty use of LORs were explored and identified.

Data analysis procedures consisted of five steps:

(1) deductively developing the initial coding scheme;

(2) transcribing interview recordings;

(3) coding interview data;

(4) inductively developing the coding scheme; and

(5) checking the credibility and validity of the data analysis.

The initial coding scheme was developed mainly by a deductive process guided by UTAUT and the results of prior related research studies in the literature review. During data analysis, the initial coding scheme was applied and revised, and the final coding scheme was constructed. Nine constructs under five dimensions of UTAUT were determined to capture the specific factors. Results were drawn out from the data analysis. The credibility and validity of the data analysis were improved by inter-coder reliability (Weber, 1990) and the process of deductive coding scheme development (Shaw, 2006). Phase I of the study identified 22 specific factors as motivating faculty use of Orange Grove (Table I) and 21 specific factors as barriers for faculty using Orange Grove (Table II).

Phase II of the study

Based on the results of Phase I, Phase II of the study used a survey to collect data from faculty users of two LORs: Orange Grove and Wisc-Online. The main question items on the survey were designed based on the results of Phase I. The reliability of the survey instrument was tested by Cronbach's alpha. A five-point Likert scale was used to measure respondents' opinions on the factors influencing their use of the LORs. The data were described and analyzed by both descriptive statistics and ANOVA techniques to provide more evidence for the results of Phase I.

In the study, the main independent variable was the faculty usage status or usage level of LORs. It was measured by the question whether they had used the LOs from either Orange Grove or Wisc-Online in their course design or teaching. It was an ordinal variable. By answering this question, the respondents were divided into three groups: Group 1 = No; Group 2 = No, but I plan to; and Group 3 = Yes. The main dependent variables were factors influencing faculty use of LORs that were identified in Phase I. The questionnaire items were designed to reflect these factors. Taking the motivating factor "useful resource" as an example, the questionnaire item was designed as, "It is

Table I.
Dimensions, constructs and specific factors motivating faculty use of Orange Grove

Dimensions	Constructs	Specific factors	No. of variables
Performance expectancy	Perceived usefulness	Useful resource	m1
	Extrinsic motivation	Reduce students' education costs	m2
	Job-fit	Education environment-fit	m3
		Course supplement	m4
		Course-fit	m5
		Support active learning	m6
	Relative advantages	High quality	m7
		Save time	m8
		Convenient for teaching	m9
		Free	m10
		Advance students' learning	m11
Effort expectancy	Ease of use	Ease for faculty	m12
		Ease for student	m13
Social influence	Subjective norm	Peer's influence	m14
		Student's positive feedback	m15
Facilitating conditions	Facilitating conditions	LOR promotion and training	m16
		State facilitation	m17
		Institution facilitation	m18
		Instructional staff's help	m19
		LOR copyright	m20
	Compatibility	Belief in sharing	m21
		Enjoy using technology	m22

useful in my teaching and course design". The Cronbach's alpha test showed that the item "I do not update my course very often" that reflects the impeding factor "non-update courses" resulted in an unacceptable alpha on the compatibility construct, so it was excluded from the subsequent data analysis. In this study, all the other alpha values ranged from 0.88 to 0.66 and so were acceptable (Gliem and Gliem, 2003). The instrument reliability was tested and the internal consistency of the instrument was considered reliable. Table I presents these factors, as well as the dimensions and constructs these factors belong to.

The survey was Web-based. Because of the limitation of Wisc-Online and Orange Grove policies, a non-probability sampling of survey subjects was used in this study. The survey invitation was posted on the Wisc-Online Web site in December 2010 and closed in February 2011. The survey invitations were also sent by e-mail to 2,978 faculty members of four colleges and two universities in Florida in December 2010 and closed in February 2011. Not all 2,978 faculty members who received invitations were Orange Grove users and some of them might not even have heard of it. Only faculty members who had user accounts or visited and browsed Orange Grove were considered faculty users. Thirty-nine out of 2,978 faculty members submitted their responses to the Orange Grove survey. Out of the 39 respondents, 18 were faculty users. Forty-four respondents from Wisc-Online submitted their survey responses. Out of the 44 respondents, 20 were faculty staff users. Phase II of the study collected data from the 38 respondents to Orange Grove and Wisc-Online surveys.

Dimensions	Constructs	Specific factors	No. of variables
Performance expectancy	Perceived usefulness	Uselessness	b1
	Extrinsic motivation	Does not help tenure	b2
	Job-fit	Course-unfit	b3
		Learning outcome-unfit	b4
	Relative advantages	Low quality	b5
		Inadequate quantity	b6
		Stable and consistence concern	b7
		Time constraint	b8
Effort expectancy	Complexity	Lack of ease of use	b9
Social influence	Social factors	Department culture	b10
Facilitating conditions	Behavior control	Other resources competition	b11
		Curriculum limitation	b12
		Course be sold	b13
		Storage limitation	b14
		Budget limitation	b15
		LOR copyright limitation	b16
	Compatibility	Non-updated courses (excluded in Phase II)	
		Creating your own LOs	b17
		Against change	b18
Self-efficacy	Self-efficacy	Not familiar with LORs	b19
		No confidence	b20

Table II. Dimensions, constructs and specific factors impeding faculty use of Orange Grove

The data were described and analyzed by descriptive statistics and ANOVA tests. The study explored the central tendency of respondents' opinions about the factors motivating or impeding their use of the LORs by descriptive statistics, and further examined the differences of these factors' effects on the three group users of the LORs by ANOVA tests, followed by the least significant difference (LSD) post hoc test to determine which group was different from the others. The results of the analysis are presented in Tables III and IV.

Descriptive statistics showed the feature of the data set as the following:

- For 12 out of 22 variables, all three group means were higher than 3.0 (No Opinion) and tended toward 4.0 (Agree) or 5.0 (Strongly Agree). These variables were m1, m2, m3, m6, m8, m9, m10, m11, m18, m20, m21 and m22.
- For 8 out of 22 variables, two group means were higher than 3.0 (No Opinion) and tended toward 4.0 (Agree) or 5.0 (Strongly Agree). They were m4, m5, m7, m12, m13, m14, m15 and m19.
- For the other 2 variables, one group mean was higher than 3.0 (No Opinion) and tended toward 4.0 (Agree). They are m16 and m17.

The ANOVA test showed for variable m4, there was a significant difference on three group means, $F(2, 32) = 6.33$, $p = 0.005$. The LSD post hoc test indicated the mean of Group 1 was significantly different from the means of Group 2 ($p = 0.036$) and Group 3 ($p = 0.001$). For the other variables, ANOVA tests showed there were no significant differences among the three group means.

No. of variables	Group 1 M	Group 1 SD	Group 2 M	Group 2 SD	Group 3 M	Group 3 SD	ANOVA tests F, p
m1	3.10	0.88	3.75	0.87	3.92	1.16	$F(2, 32) = 2.18, p = 0.13$
m2	3.10	0.88	3.75	1.36	3.33	1.07	$F(2, 31) = 0.94, p = 0.40$
m3	3.70	0.82	4.08	0.90	4.00	1.08	$F(2, 32) = 0.48, p = 0.62$
m4	2.90	1.29	3.83	1.03	4.38	0.65	$F(2, 32) = 6.33, p = 0.005$**
m5	2.90	1.29	3.50	1.67	4.00	1.08	$F(2, 32) = 2.50, p = 0.098$
m6	3.50	1.08	3.83	1.19	4.00	1.08	$F(2, 32) = 0.57, p = 0.57$
m7	3.00	0.94	3.75	1.14	3.92	0.86	$F(2, 32) = 2.69, p = 0.084$
m8	3.11	0.78	3.25	1.29	3.46	0.88	$F(2, 31) = 0.33, p = 0.72$
m9	3.10	0.88	3.58	1.38	3.62	0.96	$F(2, 32) = 0.74, p = 0.49$
m10	4.00	0.86	4.00	1.27	4.36	0.81	$F(2, 28) = 0.46, p = 0.64$
m11	3.50	0.53	3.67	1.30	3.77	1.17	$F(2, 32) = 0.18, p = 0.84$
m12	3.00	1.05	3.42	1.38	3.62	1.26	$F(2, 32) = 0.68, p = 0.51$
m13	2.89	0.93	3.83	0.84	3.42	1.44	$F(2, 30) = 1.84, p = 0.17$
m14	2.56	0.88	3.33	1.23	3.38	1.19	$F(2, 31) = 1.67, p = 0.21$
m15	2.56	0.88	3.33	1.16	3.46	1.27	$F(2, 31) = 1.86, p = 0.17$
m16	2.60	0.70	3.33	1.23	2.75	1.14	$F(2, 31) = 1.50, p = 0.24$
m17	2.80	0.92	3.33	1.37	2.31	1.18	$F(2, 32) = 2.33, p = 0.11$
m18	3.60	0.84	4.08	0.79	3.85	1.14	$F(2, 32) = 0.70, p = 0.50$
m19	3.10	0.88	3.17	1.34	2.85	0.88	$F(2, 32) = 0.28, p = 0.76$
m20	3.10	0.88	3.50	1.17	3.46	1.05	$F(2, 32) = 0.48, p = 0.63$
m21	4.30	0.68	4.00	1.35	3.85	1.14	$F(2, 32) = 0.48, p = 0.63$
m22	4.50	0.71	4.65	0.674	4.50	0.80	$F(2, 30) = 0.13, p = 0.88$

Table III.
Descriptive statistics and ANOVA tests for motivating factors

Notes: $^{**}p < 0.01$; the range of mean scores is from 1 = strongly disagree to 5 = strongly agree; the number of variables is consistent with the number of variables in Table I

Descriptive statistics showed the features of the data set as the following:

- For 2 out of 20 variables, all three group means were higher than 3.0 (No Opinion) and tended toward 4.0 (Agree). These variables were b6 and b7.
- For 1 out of 20 variables, two group means were higher than 3.0 (No Opinion) and tended toward 4.0 (Agree). This variable was b9.
- For 10 out of 20 variables, one group mean was higher than 3.0 (No Opinion) and tended toward 4.0 (Agree). These variables were b1, b2, b3, b4, b5, b8, b11, b14, b17 and b19.
- For the other 7 out of 20 variables, no single group mean was higher than 3.0 (No Opinion). These variables were b10, b12, b13, b15, b16, b18 and b20.

An ANOVA test showed that for variable b19, there was a significant difference on three group means, $F(2, 32) = 3.99$, $p = 0.028$. The LSD post hoc test indicated that the means of Group 2 and Group 3 ($p = 0.009$) were significantly different with each other. For the other variables, ANOVA tests show there were no significant differences among the three group means.

Findings

Based on the results of both phases of the study, the research questions were answered. The study found that faculty users are motivated by 22 factors to use LORs. The study

No. of variables	Group 1 M	Group 1 SD	Group 2 M	Group 2 SD	Group 3 M	Group 3 SD	ANOVA tests *F*, *p*
b1	3.10	1.29	2.73	1.27	2.31	1.38	$F(2, 31) = 1.03, p = 0.37$
b2	2.70	1.06	3.08	1.51	2.92	1.19	$F(2, 32) = 0.25, p = 0.78$
b3	3.30	0.95	2.92	1.31	2.23	1.36	$F(2, 32) = 2.22, p = 0.13$
b4	3.30	0.95	2.92	1.17	2.69	1.55	$F(2, 32) = 0.65, p = 0.53$
b5	3.10	1.10	2.83	1.34	2.38	1.33	$F(2, 32) = 0.94, p = 0.40$
b6	3.30	1.34	3.33	1.30	3.23	1.54	$F(2, 32) = 0.02, p = 0.99$
b7	3.50	0.85	3.08	1.31	3.15	1.35	$F(2, 32) = 0.36, p = 0.70$
b8	3.20	0.79	3.00	1.35	2.31	1.32	$F(2, 32) = 1.81, p = 0.18$
b9	3.20	1.23	3.25	1.06	2.69	1.25	$F(2, 32) = 0.84, p = 0.44$
b10	2.50	0.70	2.75	1.14	2.38	1.04	$F(2, 32) = 0.43, p = 0.65$
b11	3.67	0.87	2.83	1.12	2.69	1.38	$F(2, 31) = 1.94, p = 0.16$
b12	1.89	0.78	2.58	1.17	2.23	1.36	$F(2, 31) = 0.92, p = 0.49$
b13	2.10	0.88	2.42	1.31	1.77	1.09	$F(2, 32) = 1.04, p = 0.36$
b14	2.30	0.95	3.08	1.08	2.08	1.32	$F(2, 32) = 2.60, p = 0.09$
b15	2.40	0.70	2.75	1.56	2.00	1.23	$F(2, 32) = 1.16, p = 0.33$
b16	2.90	0.99	3.00	1.13	3.00	1.23	$F(2, 32) = 0.03, p = 0.97$
b17	2.40	0.97	3.00	1.28	3.46	1.27	$F(2, 32) = 2.23, p = 0.12$
b18	2.60	1.08	2.50	1.17	2.46	1.20	$F(2, 32) = 0.42, p = 0.96$
b19	2.60	1.17	3.08	1.24	1.85	0.90	$F(2, 32) = 3.99, p = 0.028^{**}$
b20	1.90	0.88	2.42	1.51	2.38	1.50	$F(2, 32) = 0.49, p = 0.62$

Notes: $^{**}p < 0.05$; the range of mean scores is from 1 = strongly disagree to 5 = strongly agree; the number of variables is consistent with the number of variables in Table II

Table IV.
Descriptive statistics and ANOVA tests for impeding factors

also revealed that all three groups of faculty respondents to the Orange Grove and Wisc-Online surveys considered 12 out of 22 factors as motivating them to use the LORs (Table V). The other 10 factors were considered as motivating factors by one or two groups of faculty users. The motivating factors indicated the reasons faculty would like to use LORs, the improvement may encourage faculty to use LORs and the benefits faculty gained from using LORs.

The study found that 13 factors impede faculty from using LORs. All three groups of faculty respondents considered 2 out of 13 factors impeding their use of LORs. The other 11 factors were considered as impeding factors by one or two groups of faculty users (Table V). The impeding factors indicate reasons that some faculty members have not used LORs, the concerns that make some faculty members hesitate to use LORs and the difficulties faculty members experienced while using LORs. In addition, the study also found that using LOs as course supplements is a main factor that has encouraged faculty to use LORs, and the lack of unfamiliarity with LORs is a main barrier for faculty use of LORs.

This study used UTAUT as a theoretical framework. It provided dimensions and constructs into which the factors in Table V were classified. As mentioned in the literature review, UTAUT uses seven dimensions and a series of constructs under each dimension to describe the behavior of user acceptance of new technologies. The seven dimensions are: performance expectancy, effort expectancy, social influences, facilitating conditions, attitude toward using technology, self-efficacy and anxiety. UTAUT determines that four out of the seven dimensions (performance expectancy,

Dimensions	Constructs	Specific factors
Performance expectancy	Perceived usefulness	Usefulness*
		Uselessness
	Extrinsic motivation	Reduce students' education costs*
		No help for tenure
	Job-fit	Education environment-fit*
		Course supplement
		Course-fit
		Course-unfit
		Support active learning*
		Learning outcome-unfit
		*Concerns about LOs' stability and persistence**
	Relative advantages	High quality
		Low quality
		Save time*
		Time constraint
		Convenient for teaching*
		Free*
		Advance students' learning*
		*Inadequate quantity**
Effort expectancy	Ease of use	Ease of use for faculty
		Ease of use for students
	Complexity	Lack of ease of use
Social influence	Subjective norm	Peer's influence
		Students' feedback
Facilitating conditions	Facilitating conditions	Institution facilitation*
		Instructional staff's facilitation
		LOR promotion and training
		Copyright facilitation*
		State facilitation
	Compatibility	Belief in sharing*
		Enjoy using technology*
		Create your own LOs
	Behavior control	*Other resources' competition*
		Course storage limitation
Self-efficacy	Self-efficacy	*Lack of familiarity with LORs*

Table V.
Factors affecting faculty use of LORs

Notes: Italics indicate barriers; *means the motivating or impeding factors agreed by all three groups of faculty

effort expectancy, social influences and facilitating conditions) are key direct determinants. UTAUT does not define specific factors to address user acceptance of a specific technology system. Instead, it provides dimensions and constructs to understand acceptance behavior. These dimensions and constructs are general and broad. In this study, 22 identified motivating factors and 12 identified impeding factors were classified into 10 constructs under the four direct determinate dimensions of user acceptance of new technologies defined by UTAUT. The other identified impeding factor was classified into the construct under the self-efficacy dimension. Thus, UTAUT provides a theoretical guide from dimension and construct perspectives to understand

the factors that motivate or serve as barriers for faculty use of LORs, and the results of the study also validate UTAUT in the context of faculty use of LORs.

Implications

The findings and results of the study can inform designers and managers of LORs about what positively or negatively influences faculty use of LORs, and serve as a basis to develop strategies to recruit faculty members to use LORs, and thus to achieve the goal of building LORs. Managers and designers of LORs may adopt the following strategies to encourage faculty to use LORs:

- *Reward faculty for using LORs*: The findings of the study confirm that the use of LORs does not help faculty achieve tenure, and this is a barrier for faculty use of LORs (Margaryan and Currier, 2006). However, the results of the study also indicate that, in general, higher education institutions are open to good education resources, such as LORs. Thus, the strategy to deal with this barrier is to get support from university or college policies to encourage faculty to use LORs by giving credit and rewards.
- *Meet faculty's needs*: The study found an important motivator for faculty to use LORs is to market LOs as course supplements, as faculty are interested in LOs that can support active learning and present a concept in multiple ways. Thus, an effective way to attract faculty to use LORs is to learn faculty needs and build LO collections to meet these needs.
- *Increase the quantity of LOs*: Lack of sufficient LOs limits faculty use of LORs. Encouraging faculty to deposit LOs and urging educational professionals to create LOs are two ways to increase the quantity of LOs in an LOR.
- *Make copyright clear*: Results of this study are different from several previous studies that mentioned that lack of copyright governing use is a barrier for users to use LORs (ANTA, 2003; Margaryan *et al.*, 2006). This study found that the copyright statements of both Orange Grove and Wisc-Online are very clear and adequately define who can use and how to use LOs. In fact, the copyrights facilitate faculty using LORs, so making copyright clear is important for faculty using LORs. Creative Commons (CC) licenses provide different levels of protection for open education resources (Bissell, 2009). The CC licenses are a practical copyright solution to LORs.
- *Implement version control and assign each LO a persistent URL*: This study found that faculty have concerns about the stability and persistence of LOs in an LOR. The policy of an LOR should include a requirement to notify contributors that withdrawing LOs is not encouraged and has negative consequences on users. If an LO is withdrawn, the reason and notice should be sent to every faculty user by e-mail.
- *Provide training and technology support for faculty use of LORs*: Caris (2004) and Rolfe (2012) found faculty's lack of familiarity with LORs is a barrier for faculty using LORs. This study found that, although faculty are not familiar with LORs, they do like to share education materials and enjoy using technologies in their teaching and course design. Thus, promoting LORs, as well as providing training and technology support, will encourage faculty to use LORs.

- *Integrate LORs into learning management systems*: The Orange Grove repository has a special feature. It can be integrated into Blackboard, a learning management system, as a resource block. With this feature, faculty can login to Blackboard and seamlessly use an LO from Orange Grove. Conesa *et al.* (2012) suggested that integrating an LOR into a learning management system may facilitate faculty using LORs. The findings of this study indicate that institution facilitation is a factor to motivate faculty using LORs. With the permission of an institution, integrating an LOR into a learning management system allows faculty to easily access and use the LOR.

Conclusions

The study used both quantitative and qualitative approaches to identify factors affecting faculty use of LORs. This study is exploratory in nature. It has three contributions. First, this study identified the factors that motivate or impede faculty use of LORs from the perspectives of actual faculty users, so these factors more accurately reflect the value of LOR to faculty in teaching and course design and the barriers for faculty use of LORs in a practical environment. Second, this study is among the first known to explore these factors using UTAUT as the theoretical framework. Third, the survey instrument developed in this study was tested as reliable. It may be useful for future studies.

Although this study has some limitations, it is very important for understanding factors affecting faculty use of LORs and is valuable for future research. The results and findings of the study are useful and practical for LOR builders and managers to recruit more faculty members to use LORs. Using a non-probability sample rather than a random sample is a limitation of this study. Future research may use a random sample of faculty users of LORs to test the results of this study. Another recommendation is that future research may explore factors that affect faculty contributing LOs to LORs.

References

Abernethy, K., Treu, K., Piegari, G. and Reichgelt, H. (2005), *A Learning Object Repository in Support of Introduction to Information Technology*, available at: www.ics.heacademy.ac.uk/Events/HEAYork2005/presentations/Tuesday/kevin%20 (accessed 7 May 2009).

Australian National Training Authority (ANTA) (2003), *Summary of Consultation 2003: VET E-learning Object Repository Project*, available at: www.flexiblelearning.net.au/projects/resources/VLOR_summary_of_consultation.pdf (accessed 20 October 2008).

Barnes, S., Li, F., Polyakow, S., Xu, H. and Moen, W. (2008), "A repository for learning objects: supporting the reuse and repurposing of redesigned courses and their content", American Society for Information Science & Technology 2008 Annual Meeting, Columbus, OH.

Bissell, A.N. (2009), "Permission granted: open licensing for educational resources", *The Journal of Open, Distance and e-Learning*, Vol. 24 No. 1, pp. 97-106.

Bond, S.T., Ingram, C. and Ryan, S. (2008), "Reuse, repurposing and learning design – lessons from the DART project", *Computers and Education*, Vol. 50 No. 2, pp. 601-612.

Campbell, L. (2003), "Engaging with the learning object economy", in Littlejohn, A. (Ed.), *Reusing Online Resources*, Kogan Pages, London, pp. 35-45.

Caris, M. (2004), "Why don't faculty use learning object repositories?", in Cantoni, L. and McLoughlin, C. Eds, *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2004, AACE, Chesapeake, VA*, pp. 2838-2840.

Churchill, D., Wong, W., Law, N., Salter, D. and Tai, B. (2009), "Social bookmarking-repository-networking: possibilities for support of teaching and learning in higher education", *Serials Review*, Vol. 35 No. 3, pp. 142-148.

Conesa, J., Minguillón, J. and Rodríguez, M.E. (2012), "Relationships between users, resources and services in learning object repositories", available at: http://openaccess.uoc.edu/webapps/o2/bitstream/10609/17721/1/Conesa_MTSR2012_Relationships.pdf (accessed 22 September 2014).

George Mason University (2003), *Introduction to Learning Object Repositories*, available at: www.irc.gmu.edu/resources/findingaid/twt_guides/repos.htm (accessed 19 November 2008).

Gliem, J.A. and Gliem, R.R. (2003), "Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales", *Proceeding of Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education*, *Columbus, OH*, pp. 82-88.

Goldsmith, D.J. (2007), *Assessing Learning Objects: The Importance of Values, Purpose and Design*, Connecticut Distance Learning Consortium, available at: www.academiccommons.org/commons/essay/Goldsmith-assessing-LO (accessed 6 November 2008).

Henderson, S. (2008), "The OnCoRe Blueprint: the art and science of repository creation", *Proceedings of 8th Annual MERLOT International Conference*, *Minneapolis, MN*, p. 15.

Hsieh, H.F. and Shannon, S.E. (2005), "Three approaches to qualitative content analysis", *Qualitative Health Research*, Vol. 15 No. 9, pp. 1277-1288.

Maloney, S., Moss, A., Keating, J., Kotsanas, G. and Morgan, P. (2013), "Sharing teaching and learning resources: perceptions of a university's faculty members", *Medical Education*, Vol. 47 No. 8, pp. 811-819.

Margaryan, A. and Currier, S. (2006), "Report on interviews with LO repository users", CDLOR Project Deliverable on Workpackage 3.1, Public Version, available at: www.academy.gcal.ac.uk/cd-lor/CDLORdeliverable_UserInterviewsReport.pdf (accessed 15 October 2008).

Margaryan, A., Currier, S., Littlejohn, A. and Nicol, D. (2006), *Learning Communities and Repositories*, available at: www.academy.gcal.ac.uk/cd-lor/learningcommunitiesreport.pdf (accessed 5 December 2007).

Margaryan, A. and Littlejohn, A. (2006), *Community Dimensions of Learning Object Repositories*, available at: www.dlib.org/dlib/march06/03inbrief.html#LITTLEJOHN (accessed 5 December 2008).

Matkin, G.W. (2002), *Learning Object Repositories: Problems and Promise*, available at: http://learn.creativecommons.org/wp-content/uploads/2008/03/learningobject.pdf (accessed 6 November 2008).

Multimedia Educational Resources for Learning and Online Teaching (MERLOT) (2008), *Multimedia Educational Resources for Learning and Online Teaching*, available at: www.merlot.org/merlot/index.htm (accessed 6 November 2008).

OnCoRe Blueprint (2008), *A Blueprint for the Establishment and Implementation of a Statewide Standards-Based Digital Repository*, available at: www.oncoreblueprint.org/ProjectObjectives.htm (accessed 6 November 2008).

Pras, A. (2001), *Sharing Telematics Courses – The CANDLE Project*, available at: www.simpleweb.org/nm/research/results/publications/pras/2001-09-04-eunice.pdf (accessed 12 September 2004).

Rolfe, V. (2012), "Open educational resources: staff attitudes and awareness", *Research in Learning Technology*, Vol. 20, p. 14395.

Shaw, E.D. (2006), *(De)coding Content: Emergent Code Identification in Content Analysis*, American Political Science Association, Philadelphia, PA, available at: www.allacademic.com/meta/p152837_index.html (accessed 5 March 2009).

Shea, P., McCall, S. and Ozdogru, A. (2006), "Adoption of the multimedia educational resource for learning and online teaching (MERLOT) among higher education faculty: evidence from the State University of New York Learning Network", *MERLOT Journal of Online Learning and Teaching*, Vol. 2 No. 3, available at: http://jolt.merlot.org/vol2no3/shea.pdf (accessed 31 March 2009).

Venkatesh, V., Morris, M., Davis, G. and Davis, F. (2003), "User acceptance of information technology: toward a unified view", *MIS Quarterly*, Vol. 27 No. 3, pp. 425-478.

Waycott, J., Bennett, S., Kennedy, G., Dalgarno, B. and Gary, K. (2010), "Digital divides? Student and staff perceptions of information and communication technologies", *Computers & Education*, Vol. 54, pp. 1202-1211.

Weber, R.P. (1990), *Basic Content Analysis*, 2nd ed., Sage Publications, Newbury Park, CA.

Wiley, D.A. (2000), "Connecting learning objects to instructional design theory: a definition, a metaphor, and a taxonomy", in Wiley, D.A. (Ed.), *The Instructional Use of Learning Objects: Online Version*, available at: http://reusability.org/read/chapters/wiley.doc (accessed 14 October 2008).

Wisconsin Online Resource Center (Wisc-Online) (2007), *Learning Objects*, available at: www.wisc-online.com/about.asp#defined (accessed 30 November 2008).

Zemsky, R. and Massy, W.F. (2004), "Thwarted innovation: what happened to elearning and why", available at: www.irhe.upenn.edu/WeatherStation.html (accessed 16 March 2009).

About the author

Hong Xu has a PhD in Information Science from the University of North Texas. Her expertise is in digital repositories. She has joined the team of the Division of Research, Commercialization and Outreach and served as a project librarian. Her project focuses on the Research Coordination Network for Climate, Energy, Environment and Engagement in Semiarid Region. She also works in the Mary and Jeff Bell Library. Hong Xu can be contacted at: hong.xu@tamucc.edu