The Texas Course Redesign Learning Object Repository: Research and Development for a Production System

THECB Learning Object Repository Usability Testing Methodology

Prepared for

The Texas Higher Education Coordinating Board

by

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1. Introduction

The goal for this study is to lay a solid ground for a near-production ready instance of a learning object repository (LOR) of redesigned courses and their components. Attaining this foundation requires both research and development activities as reflected in ten wide-ranging objectives. Assessing the achievement of project goal and objectives, and developing a plan for ongoing evaluation of the LOR when it is in production is an essential objective of the goal. The evaluation of digital library projects such as the LOR has been an ongoing focus of researchers in several disciplines. An evaluation identifies elements of focus recognizing that any one evaluation cannot address more than a few elements (Saracevic, 2004).

The International Standards Organization (ISO) defines usability as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use." A key success factor for the LOR is the extent to which the intended users can find, identify, select, and access the learning objects (LO) stored in the repository. The current study will address questions related the LOR's usability and will provide input for further refinement of the LOR. The following research protocol will discuss the theories upon which the research design is based as well as the general approach to user studies and usability assessment. Afterwards, it will outline the procedures to be taken for assessing user interaction with the LOR, including finding, identifying, selecting, and accessing LOs.

2. Theoretical Basis and the General User Research Design

Saracevic (2000) laid out a seven-level framework for digital library evaluation that attempts to account for the diverse issues related to these evaluations. These 7 levels are arranged in a hierarchy with the more general, human-centered levels (social, organizational, individual) at the top, followed by the interface level, and three systems-centered levels (engineering, processing, content), respectively. This framework will be used to design the current study that is aimed at addressing issues regarding user requirements, user behaviors, and user assessments of the usability of the LOR. According to Saracevic, issues related to user requirements, behaviors, and assessments of usability are contained within the user and interface levels. More specifically, the individual user level consists of aspects of the LOR related to how well it supports users' information needs, tasks, and activities. The interface level supports users' access, searching, navigation, browsing, and interaction with the LOR.

Rubin (1994) characterized usability testing as "the process that employs participants who are representative of the target population to evaluate the degree to which a product meets specific usability criteria." Saracevic (2004) summarized digital library evaluations and generated a list of 33 specific usability testing criteria grouped under four general terms. These four terms include (1) the content of the site, (2) the process for carrying out tasks such as searching, navigating, browsing, finding, evaluating or obtaining, (3) format, and (4) overall assessment.

Based on the input from these testing techniques, an iterative development process will be used for customizing the LOR interface. The general plan for data collection includes the use of focus groups, user and task analysis, and low and medium fidelity prototyping with representatives of the intended users. The focus groups have been completed. The results informed the project team of user preferences and assisted in developing usability metrics for usability testing. Afterwards, field work will be conducted to assess the usability of the prototype. Participants will be assigned tasks to perform and will be observed in their context of work. The data collected from the filed work will inform the iterative design of the LOR interface. Areas to be tested include: search, navigation, organization, look and feel, metadata records, and results display.

3. Procedures and Methods for Usability Testing

The proposed usability study will help answer questions about the ease of use of the current interface and the support of teaching tasks. Understandings in these two broad areas will guide the continuous development of the LOR. The research design will address specific questions regarding users' perceptions of the interface. One group of questions will center on the ease of use. The second group of questions will center on the relationship between the interactions between users and the interface as they attempt to complete instructional tasks.

Primary stakeholders of the LOR include system developers, administrators, content submitters, and end users, who are instructors teaching undergraduate courses in public institutions of higher education in Texas. In addition, the general public, undergraduate students, third-party funders, and digital library/repository owners and developers comprise a secondary group of audience of this study. All these stakeholders and audiences have common goals to improve teaching and learning outcomes. This study strives to provide end users with free access to high quality teaching materials. The results will also help other people to develop similar repositories and make their offerings more relevant to teaching tasks.

3.1 Population and Sample

There are approximately 30,000 instructors in 143 public and independent institutions of higher education in Texas. This number of institution includes 50 public community college districts with multiple campuses and 32 public four-year universities. To be included in the population, an individual would have to be listed as a faculty member, instructor, lecturer, graduate teaching fellow, or graduate teaching assistant in an institution of higher education in the State of Texas.

This study will utilize purposive samples of instructors from institutions of higher education in the North Central Texas region. Participants will be recruited through e-mail invitation utilizing campus e-mail directories. The invitation letter will inform the participants about the THECB LOR project, their role as participants, where and how the session will be conducted, the length of the session, and the principle investigator's contact information. If they indicate willingness to participate, the informed consent form will be distributed to them. For those who are not at UNT, an electronic copy of the informed consent form with the principal investigator's (PI) signature will be emailed to them. They will sign the form and fax it to the PI. For the participants at UNT, the form will be handed out to them in person at the beginning of each session. Sample size for this study will be 10-15.

3.2 Variables of Interest

Adapted from Saracevic's framework, measures for usability are organized into four categories: content, process, format, and overall assessment. Specific parameters of testing are outlined above:

- Content – including accessibility, clarity, complexity, informativeness, adequacy, coverage, quality, and authority

- Process – including learnability, effort/time to carry out, convenience, ease of use, lostness or confusion, completion, achievement of task, sureness in results, and error rate

- Format – including attractiveness, consistency, representation of labels, and communicativeness of messages

- Overall assessment – including satisfaction, success, relevance, usefulness of results, impact, value, quality of experience, barriers, preferences, and learning

This study will focus on **process** and **format** only.

3.3 Data Collection Procedures and Techniques

The two general categories of measurements (i.e., process and format) will be operationalized into several data gathering instruments and techniques. Each usability testing session contains three

procedures. At the beginning of each session, the participant will be asked to explore various functionalities provided in the LOR. He/She will do "think-aloud" when exploring the site. Afterwards, the researchers will assign the participant specific tasks (see Appendix A for use scenarios, i.e., tasks to be performed during usability testing sessions). He/She will also do "think aloud" while they perform the tasks. Their ability to complete those tasks with the LOR will be measured. Finally, a semi-structured interview will be conducted to further understand his/her experience with and opinions and critiques on the LOR (see Appendix B for the interview questions).

Testing will be conducted at two different sites, depending on whether or not the participant is at UNT. For the UNT participants, testing will be conducted in person on UNT campus. In each UNT session, two researchers will observe the participant as he/she explores the site and performs the assigned tasks. The task document will be delivered to him/her during the session, after he/she is done exploring the LOR. Each UNT session will be audio recorded using a voice recorder.

For the participants who are not at UNT, testing will be conducted using Wimba Live Classroom, a collaborative learning software tool that supports online interactive teaching and learning. The testing will be carried out in a live, virtual classroom that includes audio, instant messaging, application sharing, and content display. One researcher will be the facilitator, and two researchers will be the observers and notetakers. In each non-UNT session, the participant will share his/her screen with the researchers. A feature provided in Wimba will be used to record what the participant says during the session and to capture what he/she does on the screen. An instruction on how to use Wimba and the informed consent form will be emailed to them a few days before the testing date, and the task document will be emailed to him/her a few minutes before the session begins.

Data to be collected include Wimba recordings (for non-UNT sessions), audio recordings (for UNT sessions), and field notes.

3.4 Data Analysis Techniques

Data will be handled and analyzed using accepted practices. Only the project team member will have access to those data. Access to electronic data will be password protected. The Wimba recordings will be temporarily stored on the website. All audio recordings will be erased from the voice recorder. They will be stored on a University of North Texas secure server and be downloaded to team members' computers only. Paper copies of field notes and any other paper documents will be stored in a locked filing cabinet in the Texas Center for Digital Knowledge office. In addition, all individual participant data will be coded. All potentially identifying information will be removed from documents by assigning each participant a number and substituting those numbers for names.

Since this study will be exploratory and developmental, specific statistical procedures could change as the study moves forward in time. However, procedures will follow acceptable practices. Descriptive statistics will be calculated on all data. Survey data will include group means and other measures of central tendency. Variability will be calculated using range, variance and any other appropriate measures. Qualitative data will be analyzed using ATLAS.ti and quantitative data will be analyzed using SPSS.

Appendices

A. Use Scenarios (with tasks to be performed by the participant)

Each of the three scenarios below is designed to present a real life situation in which you are to utilize the LOR to retrieve particular information. Please complete the Browse task first, followed by the Search task, and finally the Complex task. Speak out loud your thoughts as you perform these tasks. You may ask questions about the tasks, but the facilitator will avoid giving you step-by-step instructions as this would defeat the purpose of the activity. Keep in mind that the purpose of this activity is to critique the LOR program and not to measure your skill with the computer. The facilitator may interrupt and ask you questions when necessary, and she may ask you to stop and move on to the next task, if the current one takes extensive time.

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1. Browse:
You are a college instructor who usually teaches 20th century U.S. History but this semester you have been assigned to teach the first half of the U.S. History survey course. You have less than a week to prepare. You know that there is content in the THECB Leaning Object Repository. You browse for lecture material and for at least one multimedia interactive (animation, video, or audio asset) for the first week of class. During the first week of class, you will cover early American indigenous peoples through early European exploration.

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2. Search:
As a graduate assistant you are substituting for your professor in his lecture class tomorrow, and you would like to include an interactive flash game feature in your lecture on the lost settlement of Roanoke. All the students have a laptop, in addition to the computer and projector in the room, which means that they could do a hands-on interactive. You are looking for something that will take less than 15 minutes of your 50 minute class period and that might lead to a discussion afterward.

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3. Complex:
You are a college instructor who usually teaches 20th century U.S. History but this semester you have been assigned to teach the first half of the U.S. History survey course. You know that you will be at a conference being held in Spain during the seventh week of the semester and you would like to create an online module for students to use so that they can continue attending class while you are out of the country. A colleague told you that the course material in the THECB Learning Object Repository includes online lessons. You are looking for a complete lesson that deals with the creation of the Union, the Constitution, and Federalism in 18th Century U.S. Once you find the lesson, you download it to your desktop.

B. Follow-Up Interview

Note: for the UNT sessions, the researchers will show the participant specific LOR screens mentioned in the questions; for the non-UNT sessions, the facilitator will be sharing her screen with the participant in Wimba as they go through the questions.

1. Based on your experience, do you think the LOR will require a lot of intellectual effort to navigate and use?

2. Overall, do you think the features and functions are easy to figure out?

3. Did you understand the purpose of all the pages you navigated? Which page couldn't you understand?

4. Did you understand the hierarchy on this page: http://txcdk1.unt.edu/THECBLOR_v2/community-list? For example, what a discipline is, what a course is, and what the relationships between a unit, a lesson, and a topic are. Can you easily understand all the terms/labels used in the hierarchy?

5. Are the terms and labels across the repository clear and easy to understand?

6. Do the results from searching and browsing load in an acceptable amount of time?

7. Are the terms, words, and actions consistent throughout the LOR?

8. Are the navigation bars (or side bars) consistent across the LOR?

9. Are visual presentations such as text boldfacing, italicizing, and underlining appropriate and helpful?

10. Would you use the icons under Quick Links?

11. Are all icons recognizable? Is there any icon that you couldn't recognize?

12. Is the color scheme appropriate and discernible in the results list? Are the colors varied enough, or are they blend together on your monitor?

13. Was the results list easy to navigate?

14. Did you know what to do in the results list?

15. Was it obvious that you needed to click the title to get more information in the results list?

16. Was the simple item display easy to get to?

17. Are the descriptions and metadata useful overall?

18. Would you like to see some other descriptions shown in the simple item display? What descriptions would you recommend?

19. Did you view metadata in the full item record?

20. In the full item metadata record, we have two elements "dc.relation.haspart" and "dc.relation.ispartof." Do you understand what they mean?

21. Are the labels of metadata elements such as "Learning Object Type" and "Size of the Learning Object" clear and easy to understand?

22. Currently, the LOR provides three tiers of metadata display: result list display, simple item display, and full item display. Another option is to provide two tiers only: result list display and full item display. Which one would you prefer?

23. After trying out the LOR, are you now confident in describing the LOR's functions to a colleague?

24. Are you confident in describing the materials you found in the three tasks to a colleague?

25. Are you confident in navigating the LOR easily, freely, and without problem?

26. Are you confident in using the search capabilities of the LOR to find instructional materials?

27. Are you confident in using the browse capabilities of the LOR to find instructional materials?

28. Are you confident in downloading materials from the LOR?

29. Are you confident in downloading the IMS content package?

30. Are you confident in importing the materials contained in the package into your learning management system?

31. Or would you have preferred to use SCORM package?

32. Any other comments on your experience with the LOR?

33. Any other suggestions on the LOR?