

Digital Library of the Caribbean : a user-centric model for technology development in collaborative digitization projects

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Abstract:

Purpose - The paper aims to describe the technological approach used by the Digital Library of the Caribbean project to build an international collaborative library across many separate institutions with varying degrees of expertise, technological abilities, and motivations.

Design methodology/approach - Several methodologies were employed which helped build the successful collaborative effort. A freely-distributed digitization toolkit was developed to assist with tracking and digitization of the distributed resources. In addition, on-site training was provided for most partners and was open for anyone in the area to attend. Progress and sustainability were ensured by making this development process integral with the University of Florida Digital Collections initiative and by continuing to perform usability studies on the web presence. The strong emphasis on branding and presenting the same data within differently branded interfaces in the web presence encouraged greater participation of international partners.

Findings- Digital Library of the Caribbean (dLOC), a joint project of the University of Florida, University of Virgin Islands and Florida International University in partnership with institutions in the Caribbean and circum-Caribbean, serves as the access point for scholars, students and citizens of interdisciplinary Caribbean and circum-Caribbean research, gathers together a critical mass of cultural, historical and research materials originally held in archives, libraries and private collections. This unique digital library provides content submitted directly from dLOC partners and members and allows users to browse materials or search the text through multilingual interfaces. Each of these items are generated in distributed manner by each of the partners, and then submitted to a central server. This pattern has worked quite well in a region where constant internet access is often lacking. An emphasis on partner needs, such as institutional branding, has greatly contributed to the success of this project. Involving partners in the process of usability studies, as well as conducting internal usability studies, have also assisted in the creation of a successful project web interface.

Practical implications (if applicable) - One concrete practical implication is the availability of a standards-based digitization toolkit, which can be freely used by non-members as well as members. Findings also suggest a course for digital library development in collaborative ventures. In addition, this case shows the benefits of the recurring, iterative process of performing usability studies during the development phase.

Originality / Value - This paper has value for anyone looking to build collaboration in under-represented regions.

Article Type: Case study

Keywords: Caribbean, digital libraries, sustainability, usability, collection management, digital cultural content services

Digital Library of the Caribbean (dLOC), a joint project of the University of Florida, University of Virgin Islands and Florida International University in partnership with institutions in the Caribbean and circum-Caribbean, serves as the access point for scholars, students and citizens of interdisciplinary Caribbean and circum-Caribbean research, and gathers together a critical mass of cultural, historical and research materials originally held in archives, libraries and private collections. This unique digital library provides content submitted directly from dLOC

partners and members and allows users to browse materials or search the text through multilingual interfaces. Each of these items are generated in distributed manner by each of the partners, and then submitted to a central server. This pattern has worked quite well in a region where constant internet access is often lacking. An emphasis on partner needs, such as institutional branding, has greatly contributed to the success of this project. Involving partners in the process of usability studies, as well as conducting internal usability studies, have also assisted in the creation of a successful project web interface.

Background

The Digital Library of the Caribbean (dLOC) is a collaborative digitization project from and about the Caribbean. dLOC was established by a committee of librarians, scholars, and archivists at a meeting held in San Juan, Puerto Rico in July, 2004. The goal of dLOC is to build a cooperative digital library among partners within the Caribbean and circum-Caribbean, thus providing scholars, students, and citizens around the world with open on-line access to Caribbean cultural, historical and scientific materials. Collections include newspapers, photographs, archives of Caribbean leaders and governments, official historical documents, and historic and contemporary maps. dLOC's multi-institutional collaborative model is bolstered by asking partner institutions to contribute to dLOC's evolution and success through both digital resource creation and through a shared governance model. dLOC is comprised of educational, research, governmental and non-governmental institutions aligned for the purpose of facilitating efficient access to electronic collections about the Caribbean. As such, membership in dLOC is open to archives, libraries, and museums; associations, organizations, and research centers; and publishers. Administered by Florida International University in partnership with the University of the Virgin Islands and the University of Florida, dLOC's technical infrastructure is provided by the University of Florida.

Early development of the technical infrastructure for this project promoted a user-centric model. Users were split into three main categories – project partners, web users, and scholars. The needs of each group were identified and reviewed throughout the life of the project. Through this continual systematic analysis, the project has flourished and the number of partners and use statistics have steadily increased.

For any successful collaborative effort, the concerns and needs for current and potential partners must be addressed. In dLOC, each partner contributes a portion of their materials

directly to a central server for hosting and for preservation purposes. These materials are freely served over the Internet. The needs of the partners included issues related to both the submission method and the public interface.

Digital Resource Creation

Digital resource are created and submitted by each partner. By learning digitization techniques ranging from scanning to metadata creation, each partner builds local capacity, while contributing to a central project. An analysis of the problem resulted in identification of several needs. Due to limitations on the Internet access and bandwidth throughout the Caribbean, partners needed a digitization toolkit which could work off-line, only connecting to perform the final submission of the resource to the central server. For many of the partners, the dLOC project represented their first foray into digitization. So, partners needed a toolkit which was easy to use and which required the least amount of training. In addition, for the training to be more widely applicable, the toolkit would need to be standards-based.

Digitization with the dLOC Toolkit breaks the digitization process into five steps. The first step is the creation of the bibliographic metadata, or basic description of the item. The second step is the actual scanning of the item. After scanning, an item is automatically prepared during the third step. The user reviews the images and adds structural metadata in the fourth step. Finally, the user's built digital resource is submitted via FTP.

Digital Resource Creation - Metadata

The dLOC Toolkit was developed as the metadata creation and submission tool. It is based on the Metadata Encoding Transmission Standard (METS) and the bibliographic metadata is stored in the Metadata Object Description Schema (MODS) within the METS file, although the toolkit can also read METS files with Dublin Core as the bibliographic metadata scheme. The toolkit assists with metadata creation by providing a customizable metadata creation and editing tool. Prior to digitization, partners enter the basic metadata about the item. All of the metadata is stored in a METS file in a folder automatically created for each resource.

A set of default metadata is established for each institution and project. This includes subject keywords, holding locations, and spatial and geographic information. Each toolkit is installed with the default metadata established for the Caribbean project, and additional default metadata

is added which is institution-specific. When each item is created, this default metadata is applied before the user begins to manually enter the specific metadata for the individual item.

The metadata entry is divided into two portions. The first screen (Figure 1) has general information about the resource, including titles, resource type, language of the text, creator, publisher, etc.. During digitization training, partners are trained to create this metadata from the in-hand original. Basic standards are discussed, although ultimately it is up to the local institution to set their guidelines.

The screenshot shows the 'Digital Library of the Caribbean - Digitization Toolkit' window. The title bar includes window control buttons. The main header features a sun icon and the text 'Digital Library of the Caribbean'. Below the header is a navigation bar with five buttons: '1. Describe Item' (highlighted in yellow), '2. Scan Item', '3. Prepare for QC', '4. Quality Control', and '5. Submit Item'. The 'General Information' tab is active, showing the following fields:

- Title Information:** Title: L'Etat Civil : Ce qu'il faut savoir; Series Title: ANAD'HA Liaison; Add Alternate Title; Add Uniform Title.
- Physical Description:** Resource Type: Book; Physical Description: Bulletin semestrial ; de 24 pages; Language: French; Identifier: vol 2 -#2; Type: ; Holding Location: Archives Nationales d'Haiti.
- Name Authorities:** Creator: Archives Nationales d'Haiti; Publisher: ANAD'HA; Publication Date: Août 1999.

At the bottom, there is a 'Help' link and four navigation buttons: 'Exit', 'Back', 'Save', and 'Forward'.

Figure 1: Adding the general metadata to the resource.

The second metadata entry screen, seen in Figure 2, includes the subject keywords and notes about the resource. Partners are encouraged to enter as much spatial and geographic information as possible. Abstracts are particularly encouraged for photographic material.

Digital Library of the Caribbean - Digitization Toolkit

Digital Library of the Caribbean

1. Describe Item | 2. Scan Item | 3. Prepare for QC | 4. Quality Control | 5. Submit Item

General Information | **Subjects and Keywords**

Subjects

Subject Keyword: Scheme:

Scheme:

Geographic Coverage:

Coordinates: Latitude: Longitude:

Notes

Abstract: Language:

Note:

[Help](#) | | | |

Figure 2: Adding subject keywords and notes to the resource.

The default template is kept as simple as possible, due to the varying degrees of expertise with the partners. Within the different institutions which contribute to dLOC, the amount of exposure to cataloging and metadata rules ranges from little experience to a working knowledge of AACR2 rules for cataloging. This template is easily customizable from the preferences section of the toolkit and can include a much larger percentage of the complete MODS and MARC standard. The default set of elements includes the elements in Table 1 below.

Title (main)	Resource Type	Holding Location
Title (series)	Physical Description	Creator
Title (alternate)	Language	Publisher
Title (uniform)	Identifiers	Publication Date
Subject Keywords	Geographic Coverage	Coordinates
Abstract (summary)	Notes	

Table 1: Metadata elements included in default template.

The bibliographic metadata entered by the technician is submitted with the completed digital resource in the last step. Once the item is loaded, the item is flagged for metadata review. Central catalogers review the metadata for each item and add additional metadata as required. None of the originally entered data is removed, but additional information and translations may be provided.

Digital Resource Creation - Scanning

Once the item has been described, the toolkit prompts the partner to either scan the item in hand, or to copy the scanned images into a folder automatically created for the resource. During the training sessions, partners are taught how to scan their items and instructed in the specifications recommended for their archival TIFF files, including color space and resolution. The toolkit also accepts PDF files and several forms of audio-video files. Once acceptable file(s) have been added to the resource folder, the user can go to the next step.

Digital Resource Creation - Quality Control

The third step is a fully automated process to prepare the resource for quality control review and subsequent submission. Each image file is processed to include several derivative files. Two derivative files are created for mounting on the web server: a JPEG2000 file for the zoomable image server and a simple JPEG file. Thumbnails for each image are also created, to be used in thumbnail views in the online library. An additional JPEG file is created for each page to assist with quality control in the next step. All of the information about the archival TIFF files is also added to the growing METS file.

The fourth step, shown in Figure 3, allows the user to perform quality control on the images, image correction, and enter the structural metadata about their item. All of the page images

are shown together as thumbnails. At this point, the user can visually inspect each image. The toolkit allows the users to switch the order of the pages, or delete incorrect images. The user can also name each page and create a table of contents for the resource by entering division information. Many standard division names are provided, but users can also select 'Chapter' and provide the actual name of a chapter. All of the entered information is collected in the METS file and will be used to provide an online table of contents in the final web version. If an institution chooses not to enter page names, a default is used, numbering from Page 1 through all of the pages. Likewise, an institution may choose not to add the division information for an item. In that case, no table of contents will appear online for the item.

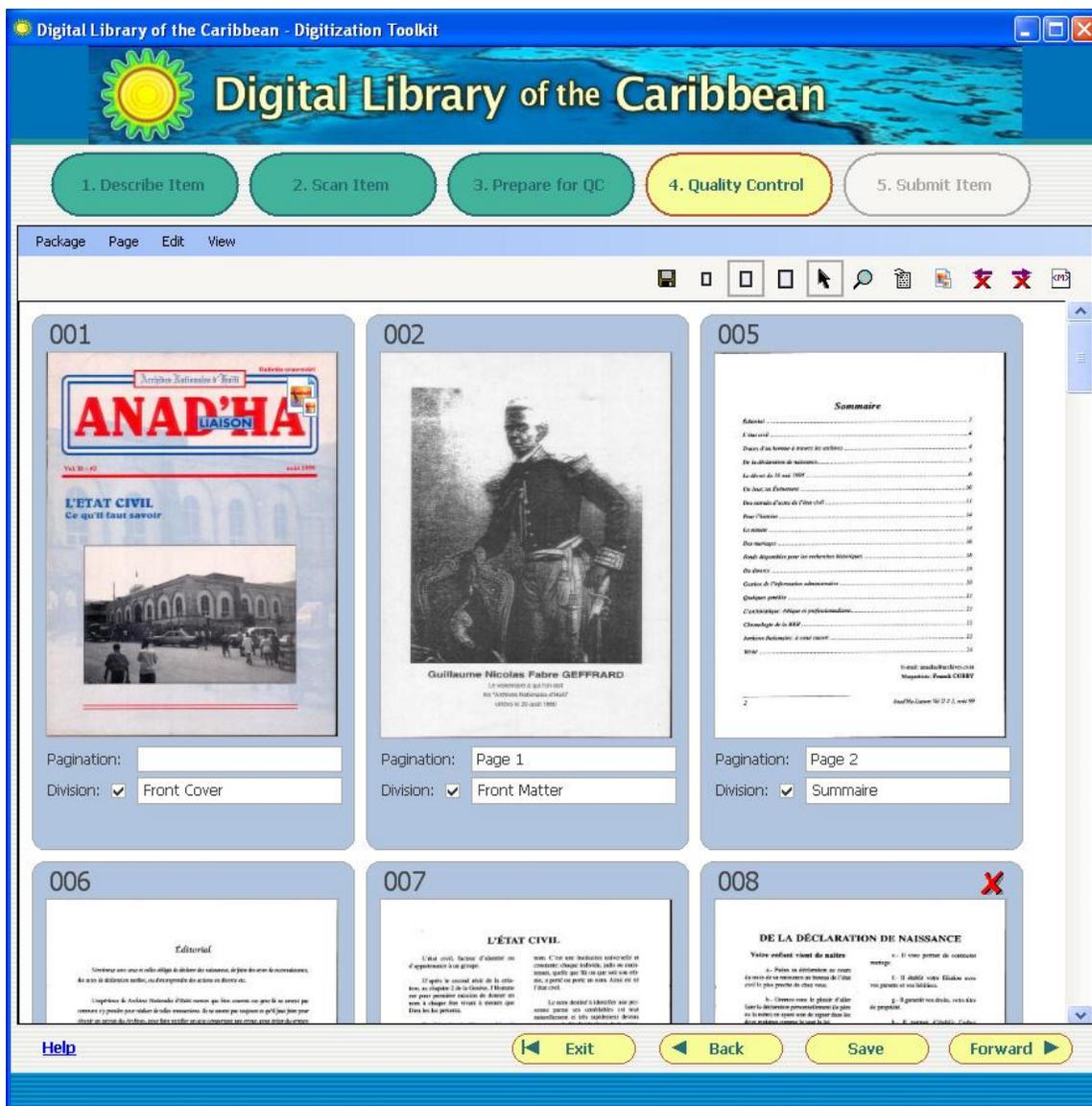


Figure 3: Performing quality control on the resource.

Each image can be edited inside the toolkit, as shown in Figure 4. This includes rotating the image, cropping the image, and adjusting the color levels and balance. Once editing is complete, the changes are applied to the archival TIFF and all of the image derivatives are recreated.

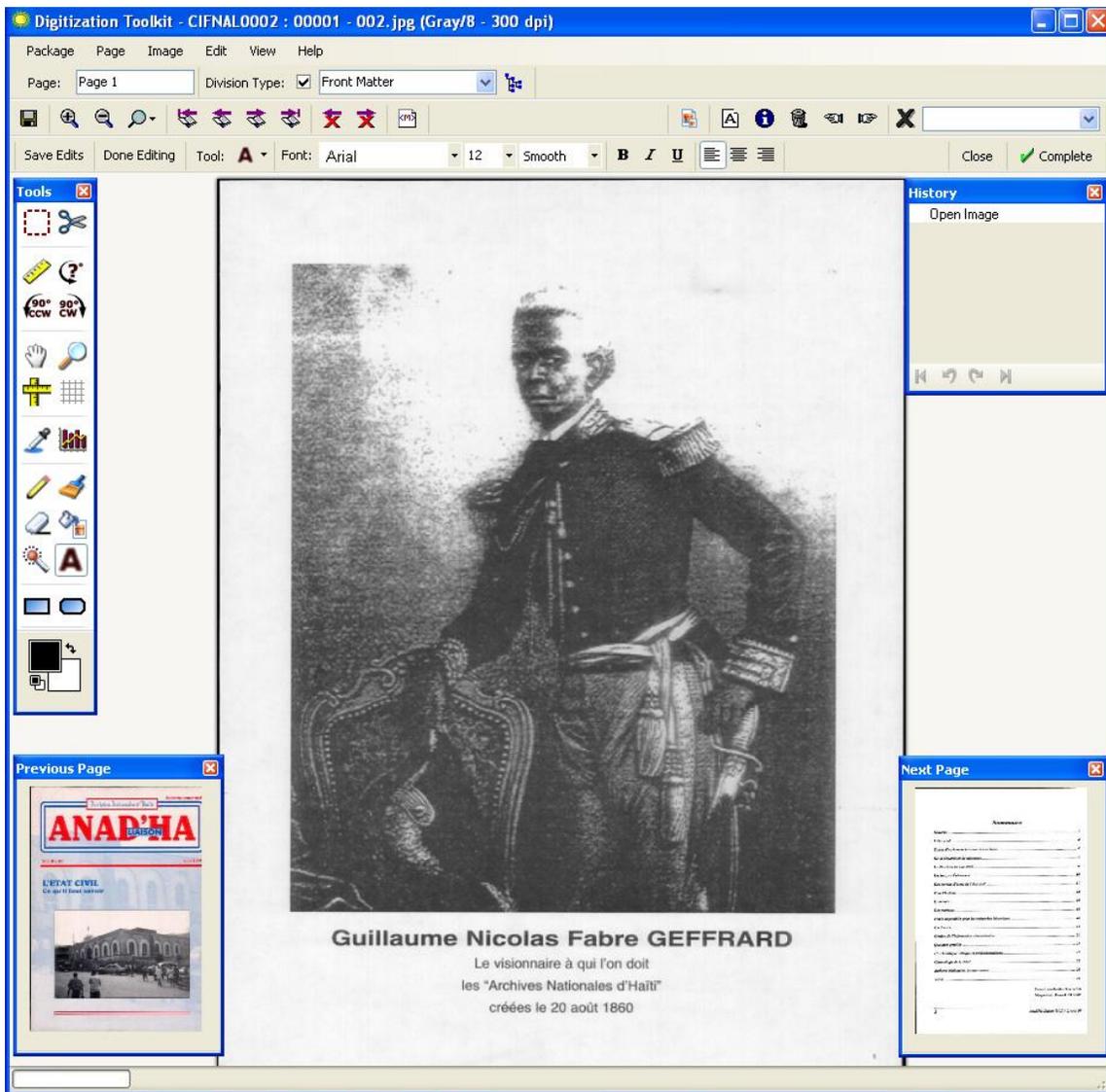


Figure 4: Editing images in the dLOC Toolkit.

Digital Resource Creation - Submission

The final step submits the item to an online library via FTP. The user can enter their own FTP information, including server name and username and password. If a dLOC License Code has

been provided to unlock the dLOC specific features, it will automatically be sent to the dLOC servers.

Digital Resource Creation - Customization

Through the course of this work, another unexpected user-base was discovered. As scholars in other fields began to hear about the dLOC capacity-building model and submission toolkit, it became apparent that there was a wider need for a simple, standard-based, offline digital resource toolkit. Already several other projects have begun to employ the digitization toolkit which was originally created for dLOC. To facilitate their use, “themes” were added to the toolkit. This allows the interface to be customized for each different project. (See Figure 5 for the view of an additional theme.) In addition, the user can select the language for the toolkit. English, Spanish, and French are currently supported, with hopes to add Dutch, Haitian Creole, and Papiamentu in the near future.

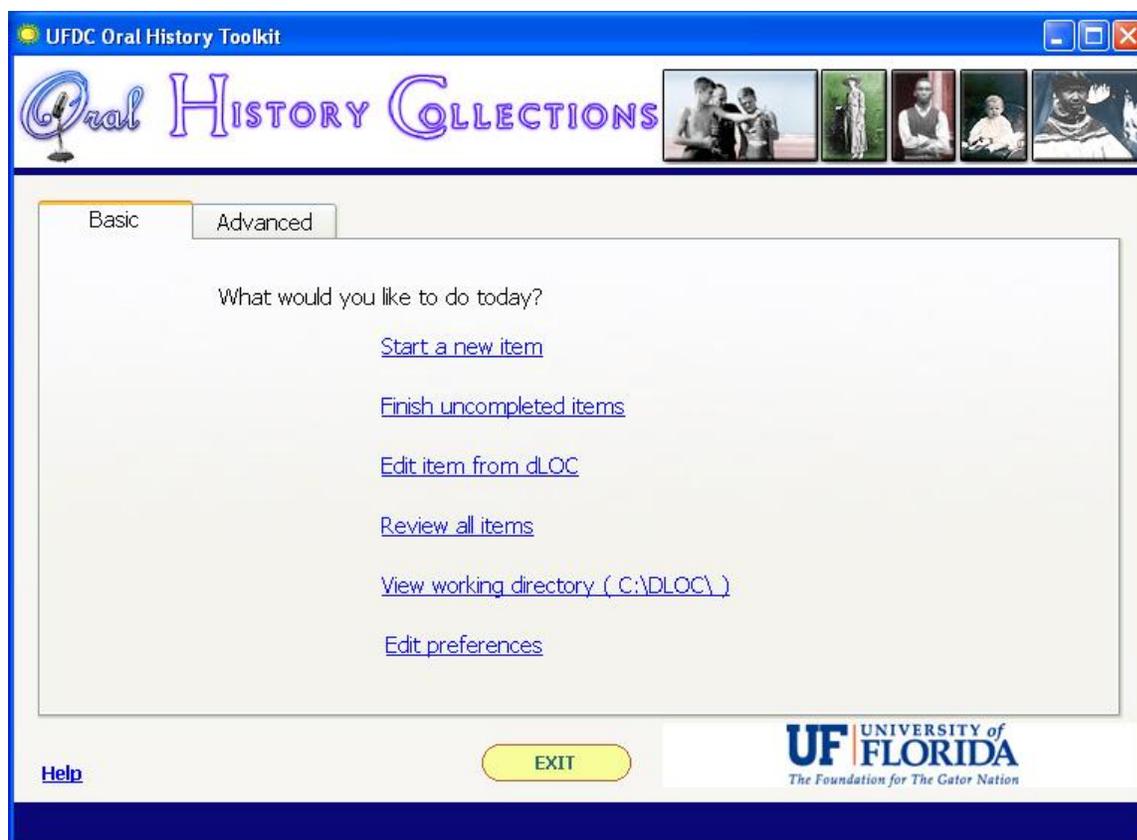


Figure 5: Theme customization in the dLOC Toolkit.

Digital Resource Creation – Usability

As the developer took part in the training which was provided to the partners, the partners in turn provided a very useful metric back to the developer. This unusual amount of developer-user interaction helped to steer the development of the toolkit. In fact, the initial release of the toolkit was much less user-friendly and often left partners confused on their next step. After about two years of use and training, a new toolkit was developed and released. Subsequent training on the new toolkit proved the increased level of usability and ease. This feedback, while short of an actual supervised usability study, was critical to the success of the toolkit and subsequently the project.

Digital Resource Creation – Future Enhancements

Work continues on the toolkit with new changes and releases expected shortly. The new version of the toolkit will add more interoperability with the MARC21 standard, allowing import and export of records in MARC XML and MARC21 formats. In addition, the C# source code is targeted to be released under the GNU license by summer of 2009. The toolkit is currently available freely for download at the dLOC project web site (<http://www.dLOC.com>).

dLOC Web Interface

The dLOC web interface (shown in Figure 6) developed simultaneously and in conjunction with the metadata toolkit, based on the requirements of the grant, needs of the users, and continued input from usability studies. The foundation for the dLOC interface is the technology employed by the University of Florida Digital Collections (UFDC) which is a METS-based presentation layer over a Greenstone core. This allows dLOC to take advantage of all the work put into testing UFDC and adds to the general sustainability of the dLOC web interface. Attempts to improve the overall delivery system for dLOC focused on two groups: partners and users. The partners needs were generally identified as branding. For the users, several usability studies were performed.

From discussions with partners, it was obvious that they were willing to contribute their time and resources to a collaborative digitization effort, but didn't want their individual contributions lost among all the others. While dLOC already had branding in the form of wordmarks when viewing an individual resource, that didn't appear to be quite sufficient. To solve this issue, two new concepts were added to the UFDC technology. Interfaces were added to allow the web page to take on a very different look and feel, often one more like the partner's institutional web pages.

Institutional pages were also added, to allow browsing and searching of only those materials added by a particular institution. The combination of institutional pages and interfaces allows dLOC to present very different appearances to the same collection of items. (See Figure 7 for an example of an interface on an institutional page.) This ability is very attractive to both existing partners and potential partners. In fact, dLOC itself is an interface, which allows all of the dLOC pages to be branded with Digital Library of the Caribbean, despite existing in the same server as the general University of Florida collections.

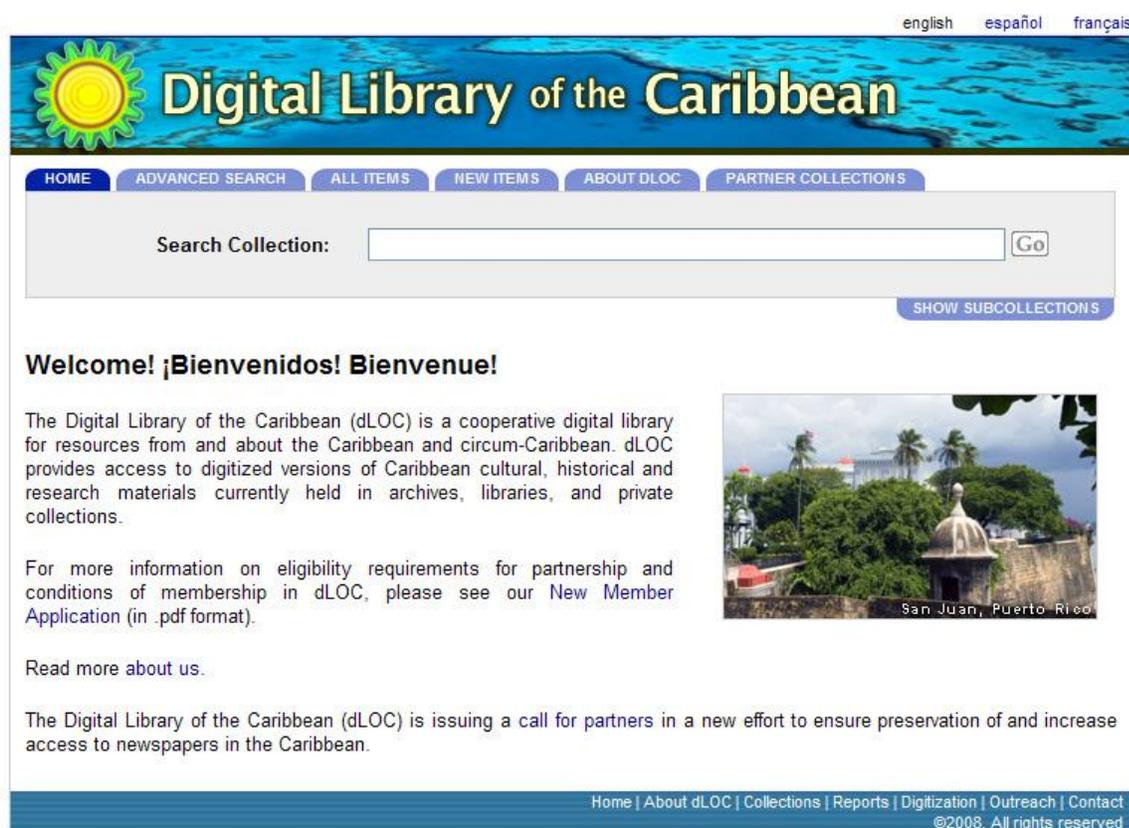


Figure 6: Digital Library of the Caribbean main web page.



Figure 7: Institutional page with an interface to mimic a different web presence.

Usability testing

Researchers have access to a plethora of content online from which to search. Some users may not understand the importance of using library-provided resources, and instead may choose to use a website solely based on how easy it is to search and navigate. Considering the competition for getting users to return to a given online resource, institutions that produce digital libraries such as UF must develop resources that are user-centered and are easy to use and navigate as well.

Developers consider user expectations in their design process to create a user-centered and appealing resource to which a user will return. Usability testing is a method to identify expectations and has had a role in design and implementation of computers, interfaces and other technology products for decades (Nielsen, 15). According to the U.S. Department of Health & Human Services Usability.gov site, usability refers to how well users can learn and use a product to achieve their goals and how satisfied they are with that process; usability means that people who use the product can do so quickly and easily to accomplish their tasks (Dumas

and Redish 885). Usability measures the quality of a user's experience when interacting with a product or system, a website or software application—"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 user" (ISO 9241-11). Overall, usability refers to a resource that:

- Is easy to learn—intuitive where basic tasks can be accomplished soon after seeing the resource for the first time
- Has efficiency of use—how fast can experienced users accomplish desired tasks
- Is easy to remember—the resource can be used efficiently the next time a user sees it
- Is satisfying to use
- Meets user and organization's needs, objectives and expectations

Because usability testing encourages users to take ownership of the resource and to continue to use it and share it, UF has engaged in testing since 2005 throughout the development or customization of electronic resources. From February 2007 to April 2008, various collections within the UFDC framework were tested, with findings discussed in two separate usability test reports (Ochoa 2007, 2008). The tests sought to examine how well the UFDC organized its 30 collections, and how the UFDC compared to similar resources in terms of usability. Testing conducted by a public services librarian at UF with experience in usability testing (usability consultant) occurred before the full launch of UFDC in April 2007, and again as part of the iterative design process to improve UFDC and its subcollections.

During this year of testing, key areas of concern identified prior to testing included:

- Are the UFDC search pages-all collections, basic and advance-intuitive?
- Do the result pages provide the type of information a participant needs?
- Are the item viewer navigation functions appropriate to ensure easy navigation and ease of use?

Further, the usability consultant ensured that general navigability and features or functionality resulting from use of certain formats beyond text were tested. Examples are images and serials found in the Baldwin Library of Historical Children's Literature and the Florida Digital Newspaper Library.

Along with these considerations, identifying the intended use of UFDC to be for research purposes, along with the type of user were essential in defining the type of the testing to be

done. Since this digital library was useful for discovering hidden research resources, the potential users of this resource include researchers, university scholars and the everyday public; therefore, testing university participants as a representative sample of the user population, using multiple testing methods would be appropriate to identify the issues of UFDC. Once testing was determined to require direct contact with end users, a human testing protocol was issued prior to recruitment/scheduling of test participants and testing. At the University of Florida the test protocol includes an informed consent and all survey instruments, including pre- and post-test questionnaires.

Scenario-based and focus group testing were used in UFDC testing. Because even minor interface details can affect the way a participant uses the resource, using a very narrow approach, i.e. scenario-based tasks to target a specific feature of the resource, was effective to identify how to improve the resource; each step, response and behavior was carefully noted and recorded by a note taker. Having the participant talk aloud during the testing provided additional information about both how and why users complete tasks in the manner they do. This type of testing provided the added benefit for developers to learn more about the thought process behind using the interface, and to identify what is not intuitive about a particular feature. In addition, focus groups were used to obtain supplemental data about errors in completing tasks and other overall user impressions.

The data collected through focus group sessions and through individual scenario-based sessions demonstrated how well the UFDC matched participant needs and expectations. Patterns in the common mistakes towards completing tasks, noted user perspectives and comments, and conclusions drawn from overall behavior were considered when listing the problems for future redesign. Overall, the feedback from testing resulted in the change to the interface, result pages and item viewer to improve navigation and retrieval. Some modifications throughout the 2007 to 2008 period included:

- Introductory/explanatory information on the resource as a whole and individual subcollections
- Better navigation including linking back to the result lists
- More intuitive design for selecting collections for a federated search
- Ease of access to resources from Result pages especially for serials
- More visible and more intuitive functions of the Item viewer navigation

Usability Testing of dLOC

In early Summer 2008, dLOC was tested as a part of the broader iterative design process for UFDC. While dLOC benefited from previous UFDC usability testing and subsequent modification, the uniqueness of dLOC as a multi-lingual resource and the requirements of the grant through which dLOC was funded, warranted testing of the subcollection.

The testing strategy for dLOC incorporated past testing experiences, but the development of the plan also relied on discussions with the dLOC Coordinator at Florida International University.

With the coordinator's help, the usability consultant identified some of the goals of dLOC testing:

- To consider the multi-site interface for the Spanish, French and English interfaces of dLOC.
- To justify additional costs for translation
- To identify needed interface problems, including use of certain terminology
- To optimize already implemented features
- To enable marketing and familiarity with dLOC among Caribbean partners and potential partners

In addition to identifying these goals, the intended use of dLOC and its audience were necessary to plan the strategy for dLOC testing. dLOC testing required direct contact with researchers, university scholars and the everyday public in the US and in the Caribbean and circum-Caribbean. The loosely formed usability team (dLOC Coordinator and usability consultant/librarian) felt university participants in the U.S. alone would only provide one perspective to identify issues and improve dLOC; usability data collected from dLOC partners would be useful.

The team identified factors of location, language, internet connectivity and staffing as possible complications to the usability testing of dLOC. While general UFDC usability testing was conducted cheaply and easily—due to testing location on the UF campus, potential onsite users and equipment readily available—the dLOC testing proved more challenging. The assumed heavy use by Caribbean and circum-Caribbean researchers forced the team to look outside of UF and FIU for test participants. This audience would require locating and contacting users who would use the content, and who would likely be non-English or multilingual speakers with unpredictable internet availability. Based on these considerations possible options for testing included:

- Incorporating usability training and/or testing across the Caribbean during already-planned UFDC Toolkit training so that each partner location can conduct usability testing
- Conducting usability testing at an event which already brought dLOC partners and Caribbean library staff together, and asking for usability testing assistance

The first option was not selected because the Toolkit training session agenda was already extensive. No dedicated usability specialist was hired to travel and provide training or testing at regular intervals within the Caribbean; the UF librarian who worked on usability testing did so as a small percentage of her position. Further, asking facilitators at each location to test was thrown out at this stage; few partners were familiar with usability testing and would first need to experience it themselves and be trained before trying to conduct the test. Plus, the dLOC coordinator would need time and resources to negotiate this new role/commitment by partners.

The second option of testing at an event was selected with evaluation of dLOC conducted at the annual Association of Caribbean University, Research and Institutional Libraries (ACURIL), XXXVIII Conference, Montego Bay, Jamaica, in June 2008. Because testing requires direct contact with end users, this location/event was useful because it allowed the dLOC coordinator, designer, and usability consultant an opportunity to work with a variety of actual users and partners of dLOC, without additional cost of travel to anyone. The session allowed users to share their experiences, comments and attitudes about dLOC and to identify problems with using the resource. It encouraged a sense of goodwill and ownership for the resource by Caribbean partners, ultimately resulting in more use and a better reputation for dLOC and UFDC as a whole.

The research methodology of dLOC testing involved scenario-based testing and a focus group session to evaluate online participant search behavior and attitude. Two sets of test questions were used. All task questions were given in writing to aid in preventing misinterpretation.

Participants completed pre- and post- test questionnaires to identify user experience using online library resources and satisfaction with using dLOC. Then all participants participated in an open group talk aloud session of dLOC which consisted of 3 questions. All attendees worked together in this session to complete the structured exercises. Participants were then split into groups to answer a set of questions focusing on basic and advanced search interfaces, multi-lingual interfaces, result pages and item viewer; these examples and guided exercises

were based on real content and reference questions directed to UF and FIU about dLOC. During the group test session, the facilitators (dLOC coordinator and usability consultant) asked participants to talk out loud about their process to complete the question and what they expected would happen; they also observed user behavior and identified users' errors. Responses were written down. Finally, the focus group consisted of a discussion on experience with dLOC, guided by the post-test questionnaire submitted.

Overall, onsite testing was a useful experiment with usability testing for multilingual users. It identified problems with terminology, use of images or icons for navigation, and the use of a tabbed approach to reach various views of the resource found.

Future of dLOC Usability

Usability testing will continue to be a critical part of the design process. Having the input of Caribbean partners and their users can offer some new and different perspectives from past UFDC usability testers. In addition, having assistance from partners to join the dLOC usability team was extended for possible multi-site assessment to further guide the development for dLOC. Since the workshop provided the theory and application of usability testing, partners have been given a framework for evaluating electronic resources in general. By evaluating dLOC themselves, participants would already be familiar with the testing methodology for dLOC.

The future for dLOC usability stems from an idea that a UF or FIU-led dLOC Assessment program can be created to centrally develop questionnaires and test instruments for the resource and to provide training. Challenges of off-site usability testing remain, however: how to provide training of usability testing for partners, site limitations (including internet connectivity and staffing), and development of a single, overarching human testing protocol.

About the Authors

Mark Sullivan works as a developer for the Systems Department at the University of Florida Libraries supporting the Digital Library Center. He has been integral to several recent grants at UF and is the chief architect of the dLOC toolkit and UF's Digital Collections (<http://www.uflib.ufl.edu/ufdc/>) He joined the dLOC project early and has taken part in every training session since its inception.

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