

University of Rochester eXtensible Catalog Phase 1

Final Report

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I. Introduction

The Andrew W. Mellon Foundation generously provided support to the University of Rochester, River Campus Libraries for Phase 1 of the eXtensible Catalog (XC) project. XC is envisioned as an open-source system that will unify access to traditional and digital library resources. XC will help research library users at any level of proficiency get more out of diverse library collections through a simple yet powerful interface that provides comprehensive results sorted into useful categories.

For libraries, XC will provide an extensible metadata platform supporting multiple schemas that can be searched simultaneously to support FRBR-like functionality and navigation. XC will integrate easily with functionality from other library applications, such as metasearch. And XC will search across digital and legacy content.

During Phase 1 of the XC project our goal was to engage in research and experimentation that would inform the development of a well-informed project plan to enable us to build the XC system during Phase 2 of the project. Our research and experimentation during Phase 1 focused upon the following six threads of activity:

- A. Learning about and building on related projects at other institutions
- B. Experimenting with and incorporating useful, freely available code
- C. Anticipating and preparing for the metadata requirements of the new system
- D. Surveying research on user practices to inform the project and guide development of XC
- E. Gauging library demand for the XC system
- F. Identifying and beginning to recruit partners to join us in Phase 2 to share the expense and work of completing the system

The following sections of this report will chronicle the work that we undertook in each of these six areas. Our work in these areas enabled us to create our final Project Plan, which was documented in our proposal for funding for Phase 2 of the XC Project, dated July 11, 2007.¹

¹ The complete XC Phase 1 Final Report, as submitted to the Andrew W. Mellon Foundation in September 2007, contained the following six appendices: XC Partner Meeting Documents, Name Authority Tool Documentation, Survey of User Research, XC Survey Results, and XC Metadata Paper. The present version of the report provides direct links to several of these documents, which are now available via the XC blog or elsewhere.

II. Threads of Activity and Outcomes

Thread A: Learn about and build on related projects at other institutions

XC Literature Review and Literature List

To inform ourselves about related projects and activities, the XC Team members engaged in a broad review of current literature related to new and emerging library technologies, especially those related to next-generation library catalogs and discovery systems. This literature review has resulted in the creation of the XC Literature List, which is available via the XC Blog at http://www.extensiblecatalog.info/?page_id=17. This list of relevant articles and sites related to similar projects categorizes resources under 11 categories, ranging from Architecture to Web 2.0. XC Team members are continuing to add citations to this list as they are encountered, to ensure that the XC Literature List remains a useful resource to the library community through the duration of the XC Project.

XC Partner Meeting

In our Phase 1 plan, we proposed the hosting of an invitation-only conference with key individuals who are engaged in similar projects. That conference took the form of the XC Partner Meeting, held in Rochester, New York, February 8-9, 2007. During the Partner Meeting, we presented our work and plans for XC to a group of 30 invited visionaries in the area of Next Generation Library Catalogs, including librarians, web developers, metadata experts, and researchers from a wide range of academic, public, private, and government institutions. Response to this meeting was very enthusiastic, while at the same time informative and cautionary. The enthusiasm was based on the value of the XC system and the success of the demonstration of our C4 prototype (discussed below). The caution was based on the size and complexity of the project as we presented it at the meeting, and based on the need for a good governance model and a plan to sustain XC into the future. The plan outlined in our XC Phase 2 funding proposal takes these cautions into account, building on the enthusiasm of prospective advisors and partners.

Response to the meeting is recorded in such places as John Blyberg's blog (<http://www.blyberg.net/2007/02/11/extensible-catalog-partners-meeting/>), in which he writes,

“I have to say that I *really* like the proposed structure that Dave [Lindahl] talked about, and as I mentioned at the meeting, there are a number of projects that are currently striving to do similar things, but none of them have really thought to harness the potential of the open source “community” like XC does. So I believe XC has a higher potential for success than some of the other projects like it.”

Terry Reese, one of the developers of LibraryFind, writes in his blog (<http://oregonstate.edu/~reese/blog/archives/417>),

“...projects like XC, the [preconference](#) at [Code4lib](#) discussion [Solr](#) and [Lucene](#) — these are developments that should excite and encourage the library community. As a community — we should continue to cultivate these types of projects and

experimentation. In part, because that's what research organizations do — seek knowledge through research. But also, to encourage the community to take a more active role when it comes to how our systems are developed and interact with our patrons.”

And Eric Lease Morgan made the following comments in his blog posting (<http://dewey.library.nd.edu/morgan/travel/xc-2007/>):

“Yes, building something like XC is a lot of work, but the time spent on such projects is not wasted. Not only will the end product be something that will solve immediate problems, but it will have a number of side benefits as well... It will enable libraries to be in greater control of their own data and information. It will enable libraries to be better equipped in meeting the changing expectations of their users. It will foster a greater number of standards-compliant implementations. It will enable libraries to bring together and provide interfaces to the wide range of library-related materials: things in catalogs, content from institutional repositories, items from special collections, scholarly materials freely available on the Web.”

Some of the comments that we have heard from Partner Meeting attendees, both during the meeting itself and in follow-up responses, have been cautionary remarks about the scale of the project and its long-term viability, such as the following:

“First, we like and appreciate the work you are putting into this project. It is a difficult task to build a community around a project in general, and there are some significant barriers, perhaps to this project... We also really believe that the project needs to become focused over one or two areas that were talked about in the meeting - for instance, the idea of building technology that would allow open access to any ILS vendor's system would be a huge win, and a fairly substantial effort.” – Jeremy Frumkin, Oregon State University

Comments such as this were extremely helpful to the XC Principal Investigators as we planned Phase 2 of the project. The feedback that we received from prospective partners also informed our remaining work on Phase 1 to develop the full framework for a modular software architecture.

The list of the attendees for the XC Partner Meeting and selected photographs from the meeting are available on the XC Blog at <http://www.extensiblecatalog.info/?p=47>.

Thread B: Experiment with and incorporate useful, freely available code

To carry out this thread, the XC Team built upon what we learned through our literature review and conversations with potential partners to identify freely available software. We experimented with a range of software and incorporated some of it into prototypes to inform the development of an architecture plan for XC.

Software Experimentation

We investigated open-source applications and frameworks that could serve as components of the XC software. Some of these include Lucene, SOLR, Drupal, Plone, MARC4J, Nutch,

Xindice, Acegi Security, Spring Framework, Quartz for job scheduling, and Apache Axis for SOAP implementation. Team members also looked at California Digital Library's eXtensible Text Framework, Endeca, numerous web services from OCLC, Amazon, Google, LibraryThing.com and many others. Our software evaluation led us to create a "component partner" category of XC partnership, and has helped us to evaluate a range of technologies that have the potential to support the XC project.

Software Prototypes

Two software prototypes were developed during Phase 1. The first, C4, showcases what a future end user interface for XC might look like. The second is a name authority tool that focuses on how XC might deal with multiple metadata formats.

The C4 prototype interface shows what a local software development effort at the UR River Campus Libraries was able to achieve during a short time period. C4 demonstrates that it is possible to create an application featuring faceted browsing and metasearch results within a single interface (similar to the features found in expensive commercial products such as Endeca and Ex Libris's Primo) at a reasonable cost. The C4 prototype has generated a considerable amount of interest as we have demonstrated it in various venues, with several libraries inquiring about how soon they could have access to the code. We consider C4 a proof of concept for the types of functionality that the native XC user interface will provide.²

For the second prototype, the XC Project Team worked with a group of five software engineering students from the Rochester Institute of Technology. As their senior project, the students designed a name authority tool that can be used across disparate metadata schemas in an environment such as XC. The tool can ingest MARC authority and bibliographic records as well as Dublin Core records, provide automated matching (above and beyond the capabilities of the University of Rochester's current ILS), and facilitate a cataloger's handling of problem reports. The Final Report of the work of the student team is available on the XC Blog at <http://docushare.lib.rochester.edu/docushare/dsweb/Get/Document-27362>.

Both of these prototypes enabled us to experiment with real-world data and freely available code to determine which programs were applicable and stable enough to depend upon in our planning for Phase 2. We now have a good understanding of these applications and will be able to take advantage of them when Phase 2 begins. Some of the planned starting points include Drupal, Lucene, SOLR, MARC4J, and our now completed name authority tool.

Software Architecture

In our Project Plan for XC Phase 2, we designed a modular architecture for XC that combines newly developed open source components with existing open source software wherever possible. These components will interact with popular commercial library systems using connectors that our partners will develop. XC's modular architecture will maximize the participation of partner institutions in the development of XC, while also minimizing the risk to the success of the project that may be inherent in distributed software development. The risk is minimized because the programming team responsible for the critical shared

² As of the time of this writing, the C4 prototype is available at www.library.rochester.edu/c4. However, as we continue to develop C4 for possible use within our own institution, this prototype may cease to be available.

components of the software will be under the direct supervision of one of the principal investigators.

The XC system will bring together metadata from a variety of sources, apply services to that content, and display it in a usable way in the environments where users expect to find it. This architecture will allow us to take advantage of innovative models for shared metadata services.

We will build the native XC user interface on top of an open-source content management system and application framework. This interface will serve as a reference implementation for a general level of functionality for XC that will include aspects of Web 2.0 technology, faceting, and FRBR-informed results grouping, as described in our proposal for funding for Phase 2. The design of this interface will be informed by the user research that will be conducted during Phase 2, as well as by the survey responses that we received during Phase 1 (described later in this report, and summarized at http://www.extensiblecatalog.info/wp-content/uploads/2007/07/XC_survey_report.pdf). To build the user interface that libraries have said that they want, and to have it meet the needs of libraries in two years when this project would be scheduled to finish, we need to look beyond what libraries think they need at this moment in time. We are working to address current needs, such as faceting and Web 2.0, by building an out-of-the-box XC client that will have these features. Beyond that, we are working to address future needs of libraries by supporting their ability to deliver an integrated web presence to their users.

Thread C: Anticipate and prepare for the metadata requirements of the new system

During Phase 1 of the XC project, we engaged in a process to define both the overall goals for the XC system and the functional requirements that will enable us to achieve those goals, especially as they relate to metadata within the system. A detailed discussion of these goals and metadata requirements, and how we plan to approach each of them, appears in the white paper, “Metadata to Support Next Generation Library Resource Discovery” by Jennifer Bowen.³

Several of the metadata-related requirements for XC concern moving metadata from one environment to another, and making metadata from various environments (and in various schemas) work together. To inform ourselves about this process, we consulted closely with established experts in the field of bibliographic metadata aggregation by contracting with Diane Hillmann and Jon Phipps, from Cornell University, for metadata consulting services. Hillmann and Phipps, the developers of the software behind the National Science Digital Library’s *Metadata Management System*,⁴ have also proposed the development of an NSDL *Metadata Services Coordinator* (MSC).⁵ We have secured a partnership with this team for Phase

³ This paper is being submitted for publication. An earlier version of the paper was submitted as part of the Final Report to the Andrew W. Mellon Foundation on September 14, 2007.

⁴ “Metadata Management System,” *NSDL Registry*, September 20, 2006, http://metadataregistry.org/wiki/index.php/Metadata_Management_System (accessed July 23, 2007).

⁵ Diane Hillmann, Stuart Sutton, and Jon Phipps, “NSDL Metadata Improvement and Augmentation Services,” 2007. Grant proposal submitted to the National Science Foundation.

2 of the XC project to develop a separate installation of their software that can serve as a metadata services hub for XC. This will allow the XC Project Team to develop only those additional services for the hub to facilitate XC, such as the development of the XC application profile and services to facilitate XC user interfaces. A complete description of this proposed partnership appears in the XC Phase 2 grant proposal. Our consultation with the Cornell team also proved instrumental in our ability to define an extensible, flexible architecture for the XC system.

Two of the XC Co-Principal Investigators undertook additional instruction in metadata by attending a two-day training session, “Metadata Standards and Applications,” co-developed by the Library of Congress Cataloging Distribution Service and the Association for Library Collections and Technical Services. This particular workshop, developed by Diane Hillmann, provided the foundation for the development of a metadata application profile activity thread in our Phase 2 proposal.⁶

The design of the metadata thread of the XC Phase 2 grant also benefits from the official role that one of the XC Co-Principal Investigators held in the development of *RDA: Resource Description and Access*, the new metadata standard being developed to replace AACR2 (Anglo-American Cataloguing Rules, 2nd edition).⁷ The announcement in May 2007 of plans to develop an RDA/Dublin Core Application Profile as the outcome of a Data Modeling meeting held at the British Library⁸ (at which Diane Hillmann was a major participant) presented an opportunity for discussions surrounding the possibility of basing the development of a metadata application profile for XC on the planned RDA/DC application profile.

Thread D: Survey research on user practices to inform the project and guide development of XC

The activities in this thread were meant to acquaint us with the user research projects that have already been done, or that are in progress, so that we could take advantage of all existing user research rather than duplicate it ourselves.

A full report is available at <http://www.extensiblecatalog.info/wp-content/uploads/2007/09/Designing%20the%20Academic%20Library%20Catalog.pdf>.

Our conclusions are that:

- We have enough information about issues associated with current catalogs from our own usability testing and the testing done at other institutions, and we will continue

⁶ One of the XC Co-Principal Investigators (Jennifer Bowen) followed up by also attending the next workshop in the LC/ALCTS series, “Metadata & Digital Library Development”, at the expense of the University of Rochester. This course also provided relevant training for Phase 2 of the XC project, by stressing the relationship between metadata and system functionality.

⁷ Joint Steering Committee for Revision of Anglo-American Cataloguing Rules, “RDA: Resource Description and Access: Background,” July 16, 2007, <http://www.collectionscanada.ca/jsc/rda.html> (accessed August 29, 2007). From 2004 through April 2006, Jennifer Bowen served as the ALA representative to the Joint Steering Committee for Revision of AACR.

⁸ “Data Model Meeting: British Library, London 30 April-1 May 2007,” <http://www.bl.uk/services/bibliographic/meeting.html> (accessed July 23, 2007).

to conduct usability testing. We continuously monitor the environment, for example through the Usability4Lib list, to keep up with what others are learning. We are also engaged in ongoing partnerships with many institutions and organizations, including several of the large vendors, and we conduct joint usability tests with them, often at our own facility. We consider this area to be well researched and not in need of special funding or activities.

- There is ethnographic research or other fine-grained research on the academic work practices of students and faculty members in higher education. We have identified several extremely useful sources, including an important survey done by Andrew Abbott at the University of Chicago, as well as theoretical work that will guide our analysis and interpretation. We conclude that further ethnographic studies are essential for design of XC.

Thread E: Gauge library demand for the XC system

As part of Phase 1, we created a survey about XC-related issues and sent it to respondents at a variety of academic, public, and research libraries. We received 68 responses. Highlights of our findings are available at http://www.extensiblecatalog.info/wp-content/uploads/2007/07/XC_survey_report.pdf. In general, we learned from libraries that they want a system that will provide better functionality to their users than their ILS currently provides, and that will not require them to migrate away from their ILS. They want to be able to easily customize their catalogs, and to integrate searching across both digital and non-digital resources. They want to provide their users with faceted search results, Web 2.0 features, and links that will allow them to bring library metadata into content management systems

Of those library respondents that have programming staff available to them, most of them have skills in XML, CSS, and PHP, in that order. All respondents had used open-source software in their libraries, and many libraries use open source applications frequently. Eighty percent of the survey respondents said that they would have enough resources to download, install, and support XC as an open source application. Most respondents said that they would want to build additional applications beyond a standard user interface for XC, or would want to provide a variety of customizations to the interface.

The vast majority of respondents to the survey (91 percent) indicated that they did not have a contract in place for an alternative commercial interface to their ILS, but over half said that they felt that they would be under pressure to consider such a product within the next 24 months. When asked whether they would be likely to try an alternative, open-source user interface that promised to solve most of their OPAC problems and that would work alongside their existing ILS, the response was overwhelmingly positive.

Thread F: Identify and begin to recruit partners to join us in Phase 2 to share the expense and work of completing the system

Partner Recruitment

During the grant period, we have been very successful at securing partnerships in the form of in-kind contributions from other institutions that are committed to working with the University of Rochester to build XC during the next phase of the project. XC partner institutions will fulfill one or more of the following roles:

Implementation partners: will ensure that XC will work with a particular ILS or other major system (such as an Institutional Repository or Course Management System), and implement a production version of XC at their institution.

Advisory partners will offer high-level guidance, helping us set the goals and directions of the project.

Component partners will share software, services, or knowledge that may be developed further and incorporated into the XC system.

User Research partners will conduct end-user studies at their institutions and help develop and enhance the software requirements for XC.

During the grant period, we negotiated and confirmed Partner Agreements with each of the following institutions. Each institution's area of contribution is listed in parentheses below:

- Notre Dame University (Aleph implementation)
- CARLI: Consortium of Academic and Research Libraries in Illinois (Voyager implementation)
- Rochester Institute of Technology (Innovative Interfaces implementation)
- Oregon State University (Innovative Interfaces implementation)
- Georgia PINES Consortium (Evergreen implementation)
- Cornell University (Component partnership: share software for metadata services hub; User Research partner)
- University at Buffalo (Blackboard implementation)
- Ohio State University (User Research partner)
- Yale University (User Research partner)

The following individuals have agreed to serve as members of the XC Advisory Board for Phase 2 of the XC Project:

- Barbara Tillett (Library of Congress)
- Karen Calhoun (OCLC)
- Andrew Pace (North Carolina State University)
- John Blyberg (Darien, CT Public Library)

In addition to receiving agreements of support from the above institutions, the XC Principal Investigators also received an agreement for a substantial in-kind contribution from our own institution, the University of Rochester, to support the development of XC and its long-term sustainability.

All of the above institutions and individuals have agreed to contribute in-kind resources, at various levels, to the building of XC during Phase 2 of the project. The specific nature of these agreements is described in our proposal for XC Phase 2.

Project Promotion and Community-Building

Over the course of the XC Phase 1 grant, members of the XC project team and other colleagues at the University of Rochester River Campus Libraries have given presentations and promoted the eXtensible Catalog project at numerous institutions and events. A list of these events, which includes sessions presented for institutions considering XC partnership opportunities, appears below:

- OCLC, Inc. (June 2006)
- California Digital Library (June 2006)
- Palo Alto Research Center (June 2006)
- ALA (ALCTS FRBR Implementer's Group) (June 2006)
- ALA (LITA Open Source Interest Group) (June 2006, plus a program session in June 2007)
- Columbia University (June 2006)
- ALA (ALCTS Forum on the Future of the Catalog) (June 2006)
- Ad hoc group at ALA on Next Generation Catalogs (June 2006)
- Xerox PARC (July 2006)
- RLG (now OCLC) (July 2006)
- Access 2006 Conference (Ottawa, Ontario, Canada) (October 2006) (podcast: <http://www.access2006.uottawa.ca/2006-10-13-06-carlton.mp3>)
- LITA National Forum (Nashville, TN) (October 2006)
- River Campus Libraries Visiting Technical Committee (November 2006)
- Annual Charleston Conference (November 2006)
- CNI Fall Task Force Briefing (December 2006)
- Rochester Regional Library Council (December 2006 and June 2007)
- XC Partner Meeting (Rochester, NY) (February 2007)
- Music Library Association Annual Conference (February 2007)
- EndUser 2007 (April 2007)
- Library and Archives Canada (April 2007)
- Cornell University (presentation for selected staff) (April 2007)
- Rochester Institute of Technology (presentation for selected staff) (May 2007)
- University at Buffalo (presentation for selected staff) (June 2007)
- University of California, Berkeley (June 2007)

- Society for Scholarly Publishing (June 2007)
- American Association of Law Libraries (July 2007)
- New Age of Discovery Institute (Atlanta) (July 2007)
- University of Rochester (numerous events)

Many of the presentation materials used for the above events are available through the XC Blog: http://www.extensiblecatalog.info/?page_id=35

Since the conclusion of the grant, we have also been invited to speak at the Library of Congress and meet with various groups of LC staff members on September 17, 2007, at the Library's expense.

We have also promoted the project through blog entries on our project website (<http://extensiblecatalog.info>), on related blogs and through two recent articles by UR Associate Dean, Stanley Wilder:

Stanley Wilder, "Baker's Smudges," *Library Journal* 131 no. 14 (September 1, 2006): 30-32 <http://hdl.handle.net/1802/3015>

Stanley Wilder, "OPAC, the Open Source Way," *Panlibus Magazine* 5 (Spring 2007), 2.

III. Project Assessment

Our grant year to carry out Phase 1 of the XC project proved to be enormously rewarding. During this planning period, we had hoped to produce a workable plan for building the eXtensible Catalog and to establish relationships with other potential XC users that would support the development of XC. We feel that we accomplished this, and much more. Our accomplishments for the year fall into a few major categories:

Vision for a Next Generation Discovery System

Through our research and our frequent conversations with colleagues, we encountered many experts and practitioners in the library and technology communities who are attempting to define what a next generation library catalog should be. Through our interactions with these experts, and with library users, we have refined our vision for what XC can, and should, accomplish for libraries. Libraries need tools to make it easier to offer library resources through the web environments that their patrons are already using. We have designed XC to facilitate this process for libraries. Some libraries still envision a catalog as a separate web destination for users, and XC will provide this option as well, but with the greatly enhanced functionality that users expect. Fundamental to our refined vision for a next generation discovery system such as XC is, therefore, that it must be flexible and extensible to work in a variety of environments.

Through our discussions and presentations about XC, we informed the library community about alternatives to commercial products, and we encouraged libraries to think about how they might use open source software. We also contributed to an interest in developing alternative technologies that might ultimately outperform the technologies that are currently in use. We see this as a hedge against locking into systems that have short-term benefits but might not be the best long-term solutions. Vendors of commercial library systems took notice of our work, and, in at least one case, tried to convince us to help them develop their own product instead of developing XC. This suggests to us that the presence of a viable open-source alternative (such as XC) to new library front end products will likely have a positive effect upon the quality of commercial products now being developed: if libraries have an alternative to a commercial product, the commercial product will need to perform even better than it might otherwise.

Building an XC Community

Through research with members of the library community, we have learned that XC is worth building, and we now understand a great deal about how to architect the system and what components to include so that it will have value for libraries and be something that can be widely implemented. Our survey of user research has both informed us about existing findings about students who use library technology and convinced us of the value of proceeding with a focused study of faculty members and students who are heavy users of academic libraries' print and digital resources.

During the grant period, we established relationships with a large number of colleagues at other institutions, many of whom are engaged in their own projects that have some potential relationship to the XC Project. Through these many conversations, we developed plans to

collaborate with a variety of other institutions – both formally and informally – in ways that will benefit not only the XC project, but also the other institutions’ projects and our other local projects as well.

We have successfully completed the groundwork for developing a community of support for XC. One measure of the success of the Phase 1 project planning process is the considerable level of institutional support that has been pledged to help implement the Phase 2 project plan. The University of Rochester has pledged \$1.52 million as an in-kind contribution, which represents 53 percent of the total cost of Phase 2. Partner institutions have pledged an additional \$587K as in-kind or monetary contributions, which represent 21% of the total budget.

We have had tremendous success in developing a select community of institutions with a strong commitment to XC and a willingness to contribute to its development. However, we have gone beyond that, to create support for XC in the broader library world from those libraries that are not in a position to contribute in-kind support to the project. On many occasions, we have been approached by colleagues after XC presentations and thanked profusely for undertaking this project. People have been excited by what they have heard about XC, and anxious to have access to the prototype that we developed during this grant. These informal, spontaneous expressions of excitement and encouragement demonstrate the widespread need within the library community for open-source alternatives such as XC.

XC Architecture and Project Plan

In our Phase 1 year we have learned what it will take to make legacy library metadata usable in new environments. Our year of talking with others in the metadata community has informed us about research in metadata aggregation and successful practices, and we have forged partnerships with others who have the expertise and commitment to work with us in this important area. The overall picture that we have gained for the metadata requirements for a next generation discovery system can provide a short-term agenda for the library metadata community to ensure the future viability of library metadata.

Based on all we learned of existing software and new projects, integrated library systems, user needs and preferences, and system and program capabilities, we were able to architect eXtensible Catalog in a way that will be workable. We have also been able to design a system that will meet current needs and that anticipates future needs. Our plan for XC takes into account a variety of detailed technology capabilities and constraints that we learned about through our investigations into various applications, research projects, and software solutions. The completion of this plan marked our success, and receiving formal commitments from partners to carry out the plan with us enhanced that success and affirmed for us that we have chosen a successful course.

Conclusions

As a result of our various activities during Phase 1, we have concluded that there is indeed a significant demand for a system such as XC. By building prototypes, we have learned what really will be required to build functionality such as faceted browsing and cross-schema authority control. Through examining the specific comments that we have received from partners and from survey respondents, we have refined the scope of the XC project, the

functional specifications for the software, and the technology that we will use to build XC – all to closely reflect the needs of the library community.

By selecting an application framework as the basis for the native XC user interface, we will lower the bar for libraries that are not currently able to do any local customization or programming for their catalogs, and provide them with an easy way to incorporate Web 2.0 technologies into their web environment. XC can thus provide libraries that have very limited technical resources with a wealth of opportunities that they would not have available to them using commercial applications.

Looking back on Phase 1, we can say without reservation that the year was a success, and that we look forward to continued success as we move forward to Phase 2.