Integrating Discovery to Improve the User Experience

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In October of 2011, a small group of librarians and technical staff, the members of MacEwan University Library's newly formed Web and Emerging Technologies Advisory Committee, held an off-campus retreat for a full day of brainstorming and problem solving. Central to the day's discussion was the problem of discovery. MacEwan University, a medium-sized undergraduate university in Edmonton, Canada, dedicates significant resources to developing its library collections to support the research and study of its students and faculty. In 2011, having recently gone through an institutional transformation from a community college to a fully accredited undergraduate university, MacEwan University Library was in a phase of active collection building, and its resources had grown dramatically in the preceding five years. However, despite having unprecedented access to more materials, particularly in electronic formats, students' survey responses indicated that their satisfaction with our collections had been steadily decreasing since 2008 (NRG Research Group 2010). The Advisory Committee discussed this paradox in depth: the Library was spending more than ever on collecting resources in easily accessible formats, it was an early adopter of EBSCO Discovery Service, a tool that was supposed to make those resources simple to find, and MacEwan also had an extremely active information literacy program that introduced thousands of students a year to the basics of finding resource in the Library. Our expectation was that these activities would lead to a measurable increase in student satisfaction with our collections, but surprisingly the opposite was happening. Why?

MacEwan's *LibQual 2011* survey provided some context; it revealed significant levels of dissatisfaction when users were asked whether we met their expectations for a "website that enables users to locate information on their own, easy-to-use access tools that allow users to find things on their own and making information easily accessible for independent use" (MacEwan University Library 2011). Many comments reflected a frustration with not being able to locate and access full-text e-journals. Although MacEwan was purchasing or subscribing to the materials students were searching for, finding and using those materials seemed to be problematic for many of them.

Two Barriers to Discovery

As with most libraries, the primary access point to MacEwan's collections, both physical and virtual, was the website. All of the tools and resources purchased and subscribed to were collected and linked to through the website. The Library spent considerable time and energy crafting the structure, organization, and design of this space, and developing content for pages about its people, services, and collections. We created widgets to launch users into the vendor-supplied discovery tool, library guides, integrated library system, and many other services. And, like most libraries, our accountability for our online environment ended at our virtual exit doors: the moment a student moved into a vendor's online space, we could no longer claim responsibility for the student's user experience. Unfortunately for our students, this philosophy has led to a confusing and disconnected user experience, and to the two main issues that were fundamentally at the root of our students' problems with discovery.

The first fundamental problem we could clearly identify was the disjointed and inconsistent experience of library discovery. Published research around user experience and web scale discovery tends to focus on the usability of the tools themselves, and the benefits of discovery layers in replacing earlier combinations of federated database searching, or individual database and catalogue searching. For example, Asher, Duke, and Wilson (2012), Comeaux (2012), and Gross and Sheridan (2011), all examine the usability of particular discovery products, and while identifying some obstacles to usability, generally indicate that web scale discovery layers lead to improvements in the overall search experience.

However, unlike the controlled environment of a usability test, holistic library discovery is messy and unguided. A typical discovery experience is provided by many different vendor-supplied products working together, and students must use multiple interfaces from the beginning of their search to the point where they successfully locate a book or article. The discovery environment at MacEwan University, prior to the 2014 launch of our new site, was an excellent example of this disjointed experience. For example, a student began her search for a book on the MacEwan Library's home page, where we displayed a search box widget for our discovery tool, EBSCO Discovery Service (EDS). Once the student entered search terms, she was launched into the EDS interface to view search results. If the student found the book for which she was searching, and clicked the "place hold" button, she was transported to the ILS, Sirsi Symphony. Here she needed to log in to the ILS, using credentials that were different from her MacEwan University login and password. Only after she had navigated this confusing gauntlet of three separate user interfaces, and an unfamiliar log in, was she be able to place a hold on a book. Students searching for articles may have had to interact with four interfaces: the

Library's website, EDS, a link resolver (SFX), and the publisher platform hosting the content. Each interface presented different navigation, different vocabulary, different look and feel, and different interactions with elements like buttons and images. Consistency, long recognized as one of the most important criteria of usability, allows users to easily navigate an online space because the elements are predictable and coherent (Nielsen and Loranger 2006; Ozok and Salvendy 2001; Shneiderman and Plaisant 2010). The uncoordinated, multi-interface environment of discovery wreaks havoc on students' expectations for consistency. A link labeled "PDF" in one interface may be called "Download Article" in another. The link back to a library's home page may move from the right side to the left, or be buried in an image. Each vendor interface requires the student to relearn the rules, and not surprisingly, our observations and student feedback suggested that students were finding discovery overly complex and difficult.

A second issue that we identified was the growing importance of mobile devices to our students. In 2011, 33% of Canadian cell phone users owned a smartphone, but the adoption of smartphones among cell phone owners 18 to 24 years old was more than double the national average, at 72% (Quorus Consulting Group 2012). We fully expected those numbers to continue to climb, and indeed 2015 statistics have confirmed this trend (comScore 2015), but our mobile site in 2011 was basic, at best, and as soon as students linked out of our site to external resources or search tools, they were at the mercy of vendors who provided mobile access inconsistently if at all. Even in 2011, there had been much ink spilled in the professional library literature over the necessity and value of providing access to all devices (Bridges, Rempel, and Griggs 2010; Cummings, Merrill, and Borrelli 2010; Lippincott 2010; Paterson and Low 2011; Seeholzer and Salem 2010). Not only was there was general agreement in the literature that mobile access to

library services was becoming increasingly important, at a local level we were also seeing increases in mobile traffic to the Library's website being tracked by Google Analytics.

As a consequence of these initial discussions in late 2011, we developed a strategic plan that prioritized improving the students' search experience by solving these two issues. Over the following three years we worked on a number of initiatives that explore the concepts of mobile first delivery, and more importantly, integration of our vendor-supplied services into a single user interface.

First Step to Integration: The MacEwan Lib iOS App

Considering how many vendor interfaces we rely on, it was a daunting task to conceptualize how best to integrate them into our online environment. As a first step, we decided to start with a small, well-defined project that could address some of our concerns with mobile access, provide a proof-of-concept product, and help us begin to tackle the design challenges that small screens produce. Our top priorities were to integrate our discovery tool, the EBSCO Discovery Service and our ILS, Sirsi Symphony, into a single unified interface. By early 2012, both EBSCO and Sirsi were providing APIs or web services that would allow us to interact with the products without relying on their vendor interfaces.

We submitted a proposal to an internal *MacEwan Student Technology Fee* grant to secure funding to develop an iOS app. We recognized the many constraints that exist in developing a platform-specific app, but these concerns were outweighed by the benefits for our situation. An iOS-specific app would allow us to design for a limited number of screen sizes and a single operating system. We could also produce one single, defined product. At the time, apps were

gaining significant traction, and of the mobile visits to our site, over 70% were coming from an

iOS device. Most importantly to our development team, the restricted scope of this project would

provide us with opportunities to become familiar with the different technologies, and allow us to

solve problems in a lower-risk environment. We viewed this project as a learning experience,

and an important step towards our ultimate goal of integrating our discovery environment with a

responsive library website. Our proposal was successful in securing funding and we worked with

a local Edmonton company to develop the MacEwan Lib app that was launched in October 2012.

The MacEwan Lib app was a simple concept, but continues to be an uncommon approach

in library mobile app development. Rather than creating an app that links out to our discovery

tool, catalogue, and other external services, we used a combination of vendor and

custom-developed APIs and web services to integrate discovery and user account functions into

the app itself. The result is a much more seamless user experience with a single user interface.

 When users first open the app they're asked to authenticate with their MacEwan credentials. A

simple local application checks a user against Sirsi Symphony, EDS, and other University

services. Once users are authenticated, the MacEwan Lib app can store the credentials on their

device, so they only need to log in again if their password changes or they choose to log out.

The MacEwan Lib app uses Sirsi Web Services to manage holds, track users' checked out

and overdue items, display user fees, and renew items. It uses the EDS API to search the

catalogue as well as MacEwan's licensed database content. Together, these services offer

incredibly powerful and flexible design options for the user interface. For example, a user can

conduct a search directly within the app. Search limits are expandable from the bottom of the

page (see Figure 1). If a user finds a book that she would like to place on hold, she can tap a hold

button directly within the search results (see Figure 2). The MacEwan Lib app places the request

in the background with Symphony Web Services, and the user only needs to confirm her pickup

location (See Figures 3-5.) To check on the status of the hold, or to renew items she has already

checked out, she can view her account within the app. Other library information, such as hours,

contact details, and branch locations, are contained in a local database, and the app makes use of

built-in iOS functionality to add value such as maps and directions to branches and simple

dialing of phone numbers. PDF articles can be saved to the device for reading offline or shared

using familiar tools. Because the MacEwan Lib app consolidates all of these services, the user

only interacts with a single user interface that is custom designed for the device he or she is

using. The user experience is dramatically improved.

[INSERT FIGURES 1-5 APPROXIMATELY HERE]

Response to the app from students and staff at MacEwan was extremely positive. The

student newspaper ran two feature stories (Bell 2013; Pennyfeather 2013), the app was

shortlisted for a Digital Alberta Award - Best in Mobile Applications, and won the MacEwan

University Award for Innovation in 2013. Actual engagement with the app is more difficult to

assess. Although it has been downloaded by over 3400 users to date, who have run more than

41,300 individual sessions, 1295 of those users only interacted with the app on the day they

downloaded it. However, there is a significant number of users who return to the app and use it

frequently. 25.8% of users are still interacting with the app a month after they've downloaded it,

and we record an average of 18.56 active users every day, with peaks that coincide with the

academic schedule. We conducted in-person user tests with students and identified improvements to our design. We also integrated a new service, Ares eReserves, by building a local API to communicate with Ares and connecting it to our app. Now users could easily see items on reserve for their courses in the main menu of the app without logging in to a separate service. We released a new version with this feature in fall 2013.

The MacEwan Lib app was an excellent proof-of-concept project. It provided us with a useful testing ground for exploring the concept of integration in a low-risk environment. We could solve problems like authentication and slow load times without big scale changes to the rest of our web environment. We were also able to experiment broadly with designing the interface for a mobile discovery experience that worked well for our students. The confines of designing for a restricted number of screen sizes and operating systems allowed us to focus on the details and provided useful boundaries on the scope and scale of what we could do.

However, it was clear from the outset that the app would only be a first step in developing a fully integrated online experience. An iOS app has significant limitations. While ideal for providing a working proof-of-concept the app is only accessible to those with an iPhone or iPad. Although the majority of our students using mobile devices were on these platforms, a sizeable number were not, and many had no smartphone at all. Almost immediately post-launch we began to field questions from students and faculty asking when an Android version would be available. In addition to problems of access, creating an app also creates a new user experience problem in that there was now very little consistency across platforms. Users coming to our website would have a very different experience from those using the app, creating a similar issue to the one we were seeking to solve. Finally, maintenance and updates for iOS apps can be

challenging. Every time we want to make a change to the code, a new version needs to be uploaded to the iTunes App store and made available to users. Users may or may not update the app on their device, making critical fixes difficult to distribute.

The Virtual Services Integration Project

Responsive web design (RWD), first described by Ethan Marcotte in 2010, offers solutions for issues of multi-device access and consistency across platforms. The popularity of this approach has increased dramatically in recent years, and many libraries have successfully integrated RWD strategies into their online environments. Kim (2013) and Glassman and Shen (2014) provide useful overviews of the many benefits to libraries of a responsive approach, as does Reidsma in his recent LITA guide to responsive web design (2014). Rempel and Bridges (2013) identify responsive design as a solution that allows mobile site users more flexibility than a pared down mobile version of their website, while Gayhart, Khalid, and Belray (2014) describe the University of Toronto's responsive catalogue.

We decided to scale up the concepts we explored in the MacEwan Lib app within a responsive web design that would consolidate our high priority services and provide an integrated discovery environment accessible from any device with an Internet connection. We began preliminary planning on this project, named the Virtual Services Integration Project (VSIP), in summer 2013. The new online environment launched in January 2015. In addition to being a totally redesigned and restructured website, this new environment includes discovery and user account functions and a responsive web design framework.

The working concept for VSIP includes a number of different components, all of which need to work together seamlessly in order to provide a fully integrated, user-friendly experience. Building on the knowledge gained during the development of the MacEwan Lib app, we used a combination of vendor-supplied APIs and web services along with locally developed applications to integrate discovery and account functions within a content management system.

Similar to the structure of the MacEwan Lib app, we are using the EBSCO Discovery Service API to power our discovery functions and Sirsi Symphony Web Services to manage account functions. However, rather than connect these services directly to the user interface and content management system, we built local APIs to act as an intermediary layer. Although our custom APIs mirror some of the existing functionality of the EDS API and Sirsi Web Services, they are a critical component of our integrated environment. Our locally developed APIs allow us to separate the display of information in the user interface from the queries being passed to third party services. They also provide a standardized format to display items retrieved from different services, provide a single point of contact for external services, unify elements like session numbers and database IDs, and give us a measure of flexibility and independence in the event we change providers for major products like our ILS or discovery service.

The three most important APIs we constructed were simply named "Search," "Borrower," and "eReserves." The Search API places calls to the EDS API (for example, a search term and location limit) and returns results in a standard format. The Search API also places calls to Sirsi Symphony Web Services to retrieve item-specific information, such as a call number, availability, and status. The Borrower API manages user account functions. This API connects Sirsi Web Services to our user interface, manages authentication of individual users, and places

calls to Sirsi Symphony to make and cancel holds, renew checked-out items, display fines and complete other account functions. The eReserves API manages the connection between the user interface and our electronic reserves service, Ares. We use this API to send user information to Ares and return relevant courses and item information.

The user interface is built primarily in Drupal through a combination of custom and contributed modules. Drupal's flexibility, modularity, and extensibility were a good match with the level of experimentation and adaptation we needed for this project. Finally, we wrapped up the responsive elements of the design in a theme based on the Zurb Foundation framework.

Integration and the User Experience

Throughout the development process, user input has been an invaluable component of determining design and functionality. Early in the planning stages of the project, we ran student focus groups to probe student needs and expectations, met with faculty to help us understand their work processes, and held workshops with Library staff to help pin down key components based on their frontline experience. We approached this project as a holistic redevelopment of the entire web environment, rather than the creation of a standalone discovery tool, and our user testing strategy reflected this philosophy.

Post-launch user testing has been critical to ensuring the success of the new web environment and is an ongoing exercise with rapidly shifting priorities. One of the measures of success we identified was ensuring users could complete six top tasks in the new site: find a book, find an article, locate a database, place a hold on an item, determine the library's hours, and locate citation help. We conducted user testing with two methodologies to generate rich,

qualitative data. We used Krug's "Thinking Out Loud" protocol (2006) to run a series of testing

sessions where participants were asked to communicate their thought processes as they worked

through tasks. We also used "Guerrilla" usability testing (Nielsen 1994) to examine specific

aspects of functionality, or when testing a specific design improvement.

After the testing, we analyzed the data and classified the usability issues. We were

pleased to see that the majority of testing participants were able to accomplish the defined tasks.

For example, finding a book and placing a hold, a significant obstacle in our previous web

environment, presented little difficulty to participants. This improvement can be attributed to a

clear call-to-action -- the Place Hold button -- appearing in the results list, and the seamless

integration we created between the discovery layer and ILS (See Figures 6-9).

[INSERT FIGURES 6-9 APPROXIMATELY HERE].

However, there were definite problems associated with our discovery design. The facet

limiters on the results page were not very visible, and students misunderstood their function

because of ambiguous labels. Some participants had difficulty discerning different formats due to

the similarity of representative icons. MacEwan University Library is a member of a consortium

of academic libraries with a shared catalogue, and participants also had difficulty differentiating

between items that were available at MacEwan and items that were available at our partner

libraries.

Improving these problem areas is an ongoing exercise, carried out in small development

pushes that tackle prioritized issues first. However, because we have complete control over the

interface, we have a tremendous amount of flexibility in our capacity to create solutions that meet the needs of our users. For example, in an early effort to easily visually identify material from our local collections, MacEwan items were shown in the results list with a subfield that displayed the call number. Items that were from a consortial partner library would appear in the search results without a call number. Our testing participants were confused by this distinction, so we clarified the design by creating three different labels: Available at MacEwan, Unavailable at MacEwan, Available at a partner library. The text is now clearly identified as a clickable link, uses a color-coded icons to provide visual emphasis, and expands to display the call number and status of the item. These changes led to substantial improvements when examined with guerilla usability testing.

Conclusion and Challenges

Despite positive initial feedback, it's still too early to understand fully how successful we have been in improving the discovery experience by integrating our online services through our web environment. We have solved our primary goals of creating mobile access to all devices, by working with a responsive web design framework, and we've integrated our discovery service and ILS seamlessly within that space. However, as a result, we've created some significant issues. For example, we must consider how to provide access to functions that are embedded within vendors' products. EDS provides users with the ability to select, save, and share lists of items, along with formatted citations. To duplicate these features in our environment requires assessment and prioritization, and a commitment to expending resources to recreate services that we are already paying for through our subscriptions. Although there's a strong case to be made

for our ability to improve on the user experience provided by the vendor, in times of economic

constraint, this position may not be defensible. At issue too is the quickly shifting nature of

library discovery. With the growing prominence of linked open data, this project may prove

prescient, allowing us to adapt more easily the output of our APIs to make our collection

metadata accessible more widely. On the other hand, without careful planning for the future, and

adequate resources to ensure continued support for this initiative, we may find ourselves quickly

outdated.

Regardless of the eventual outcome, this project has proven an excellent testing ground

for innovative ideas around discovery. By eliminating our dependence on vendor interfaces for

our discovery service and ILS, we have been able to take complete control of the user

experience. Although shifting responsibility for the design of that experience from the vendor to

the library is at times frightening, is also ultimately empowering. Rather than be faced with the

frustration at our inability to influence the design of vendor interfaces, we now have the ability to

change what isn't working for our students. Ultimately, this project represents not just a new

approach to discovery, but a strong commitment to prioritizing the student experience.

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