Big Ten Academic Alliance Geoportal Interface and Usability Assessment Report

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Internal report on heuristic analysis, usability testing, and Interface Steering Group recommendations for the Big Ten Academic Alliance Geoportal.

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Introduction and Overview of Group Activities

The Interface Steering Group convened in Fall 2016 with the charge to assess the interface and usability of the Big Ten Academic Alliance (BTAA) Geoportal. The team included six members from five institutions of the Task Force and a usability student assistant. They focused on determining perceived usefulness and perceived ease of use, which are important factors in determining acceptance of new technologies (Saade & Bahli, 2005; Adams, Nelson & Todd, 1992; Baroudi, Olson & Ives, 1992). Usability tests and heuristic evaluations were chosen as methods of evaluation as they have a long standing in measuring and managing website engagement and essential in the process of iterative design (Letnikova, 2003; Campbell, 2001).

Giving back to the GeoBlacklight community provided another motivation behind conducting the usability study of the BTAA Geoportal. As open source software, GeoBlacklight relies on a robust community of developers to contribute to the code base. Because the BTAA Geospatial Data Project does not include a full-time developer, our project is not able contribute much code to GeoBlacklight. Our project hopes to give back to the community with usability findings that will benefit other portals built with GeoBlacklight.

The group began with an important question: Who is/are the target audience(s) of the geoportal? Addressing the needs of diverse users, in part, motivated the Task Force to select GeoBlacklight in the first place. This is because GeoBlacklight distinguished itself among geoportal technology as being designed for an audience beyond advanced GIS users (Hardy & Durante, 2014;

Stanford, 2014). The project's decision to include records for scanned historical maps meant that we anticipated serving users who may not be familiar with GIS conventions and terminology. The group discussed this issue at length and decided to see if usability evaluation of the site identified differences in the experience of users with dissimilar backgrounds.

Heuristic Evaluation

Heuristic evaluation provides a way to assess a user interface against established principles of usability. The members of the Interface Steering Group completed a form designed to guide us through some of these standard usability issues and evaluate our interface. The group produced an overall score of 82/100. Despite a relatively high score, the heuristic evaluation identified some usability issues. The keyword search proved the most problematic in the heuristic evaluation as searches often did not return expected results. Conducting the heuristic evaluation also sensitized the members of the group to the user experience with the geoportal and helped us prepare for user testing. The full Heuristic Evaluation Analysis is available here.

Developing and Administering the User Tests

The Interface Steering Group completed a total of 16 users tests, including users with and without GIS experience, and representing the span from undergraduate student to advanced researcher. Three institutions completed the user testing on site: University of Michigan, University of Minnesota, and Michigan State University.

Task development for the tests proved challenging. We wanted to assess various features of the geoportal, but were aware of the likely knowledge gap between different users. We found writing tasks that provided generous background information without making assumptions about someone's experience with GIS impossible, because suitable user tasks should provide all of the context that the user might need to complete it without giving unnecessary hints. Therefore, users were split into two groups: GIS pros and GIS novices. We developed two very similar, but not identical, sets of tasks for each group with the intention of enabling a high probability of task completion while still identifying potential differences between them.[1]

Users tests took approximately one hour to complete. Most tests were conducted by two people: one serving as moderator and the other as note taker. In some cases, only one person was available to administer the test and served both functions. The moderator asked a few introductory questions to determine the correct set of tasks. The user then completed the tasks without intervention from the moderator or notetaker. If users got stuck, the moderator prompted them to do what they would do at home or in their office. Users were asked to indicate when they had completed a task; the moderator often asked the user to rank their confidence that they completed the task correctly on a scale of 1 to 5. After completing the tasks, the moderator debriefed the user, followed up on issues related to tasks, and asked the user to provide feedback on each of the three main sections of the Geoportal: home page, results page, and item page. During this debrief period, the moderator and/or note taker answered any questions from the user about the interface or the larger project.

[1] See Appendix I and II for the user testing tasks.

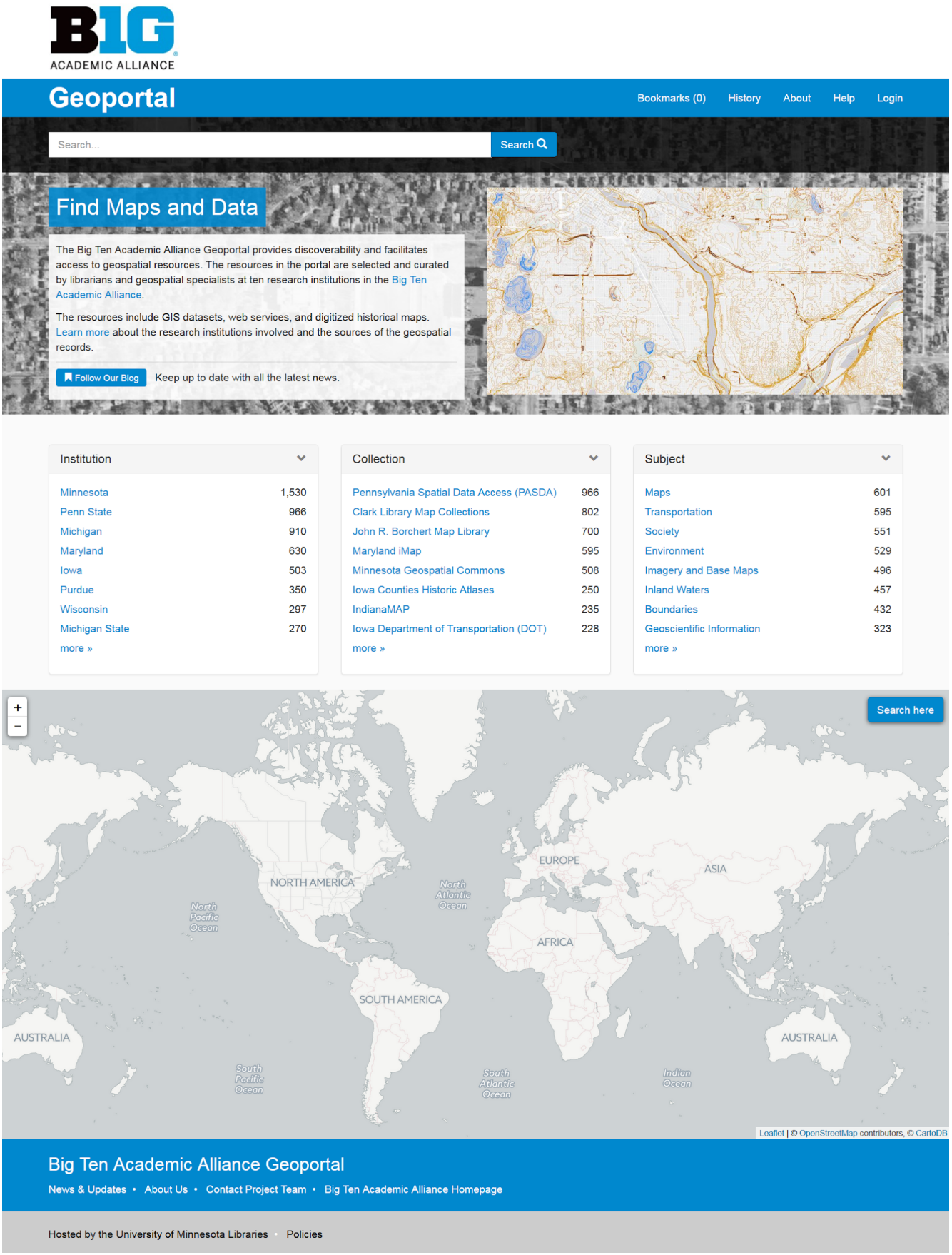
User Test Results and Observations

An exercise using Post-It style notes to organize findings provides a common way to identify trends in results of user testing and serves as a debriefing mechanism for the researchers. Because other members of the group performing the tests work in distributed geographical locations, a physical session would not work. We instead held a virtual meeting and used Trello, an online project management tool, to analyze and combine findings for user tests. We created entries in four categories: observations, insights, questions, and recommendations. Trello offered helpful features for organizing and prioritizing the findings of the user tests.

Screenshot of Trello project board

Site Structure

Users expressed unanimous praise for the visual design, color, and aesthetics of the site. Several individuals commented that the site was straightforward to use and that the simplicity of options made it easy to learn. An ignored design feature was the use of icons for institution, access, and data type. Users did not know what these icons are supposed to represent, and none of the users discovered their explanatory hover labels. Users navigated the site by performing searches and occasionally clicking the site logo to return to the homepage. Not one user clicked on the main toolbar to view the About, Help, or History pages. Many users also did not notice the navigation options for “Back to search” and “Start over.”



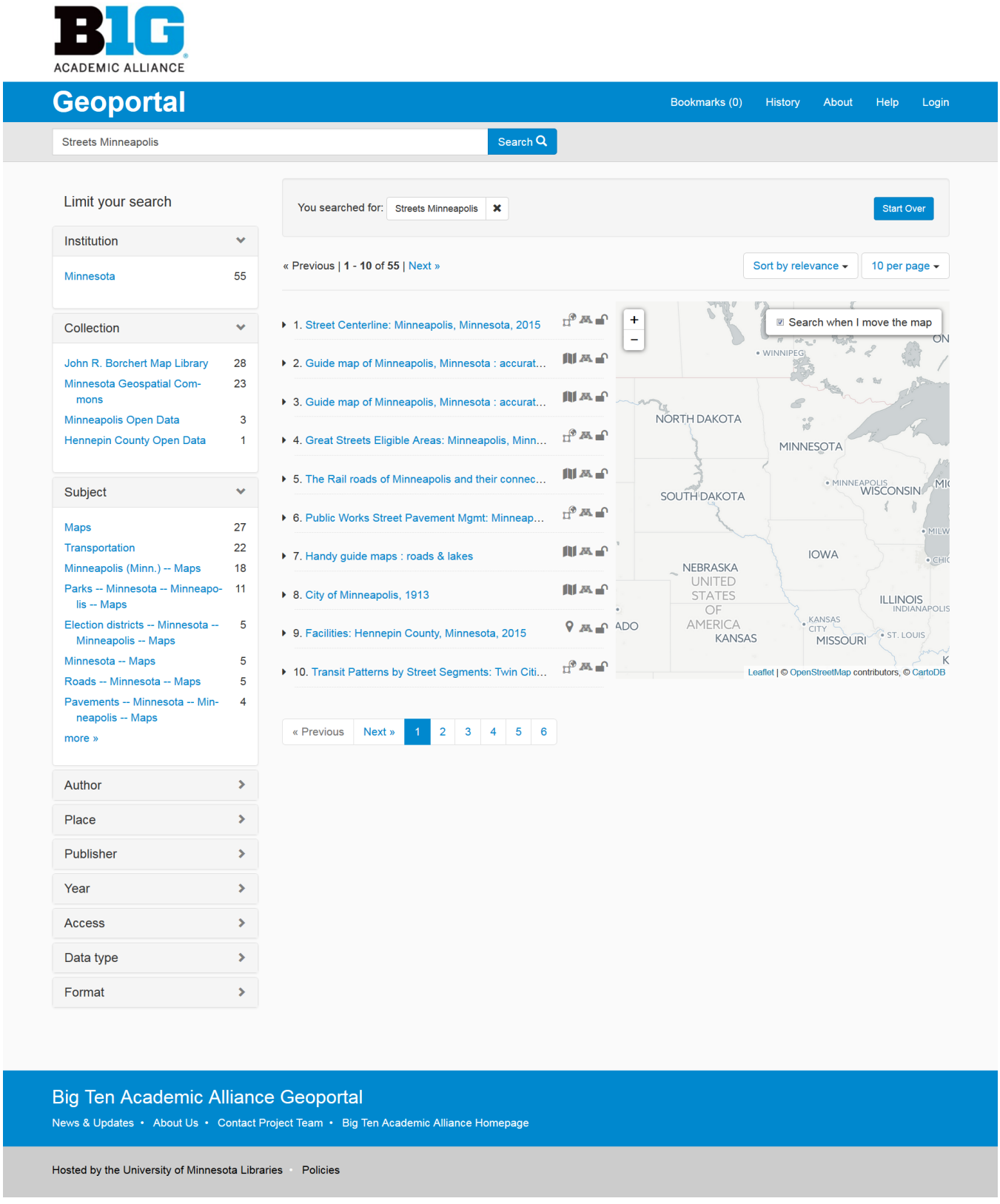
Screen Shot of Home Page (Taken 4/14/2017)

Search Strategies

The geoportal offers three main search functions: a text box, a map inset, and facets. The primary search strategy utilized by all participants was to enter text into the search box. In many instances, this strategy returned limited results. The most common cause of a failed text search was after typing in a place name or phrase that did not exist in any of the metadata records. When this occurred, users were often stymied and did not know how to proceed. For example, one user searched for “Ann Arbor, MI.” The state abbreviation “MI” did not appear in any metadata records, causing surprise on the user’s part that the Geoportal did not seem to include items for the city of Ann Arbor.

On their own, users did not initially identify the map inset as a search tool. After the map was pointed out and its functionality explained, users did take advantage of it to browse for items. Only one user identified that the map inset offered another way to search on the results page, although they initially did not see it on the homepage. The user said that the text “Search When I Move the Map” next to a checkbox that appears on the results page looked “just like Yelp.” This allowed that particular user to learn that the map search on the homepage provided the same search functionality.

The geoportal lists ten facets stacked upon each other on the results page: Institution, Collection, Subject, Author, Place, Publisher, year, Access, Data type, and Format. Users rarely clicked on facets below the first three. Some of the labels on the facets were not intuitive to users, particularly in the cases of “Institution” and “Collection.” Users often selected values from these facets anticipating that they would filter the results to a location. However, these facets represent administrative metadata that did not provide meaningful information to the users. One user said directly, “The institution and collection part were not helpful.” Users found the third facet, Subject, helpful for exploring the overall available content. However, these keywords had not been standardized for capitalization, which negatively affected scrolling, since the same or similar keywords appeared multiple times. Although the Year facet appears farther down the list, several users accessed it. They struggled with its default sort, which lists the most commonly occurring dates on top. Users expected the sort to appear in chronological order, and felt frustrated by its lack of range setting. Lastly, many users did not notice that they can combine facets to narrow down the items returned. As a result, they also did not realize that as they clicked on facets, the system “remembered” selections, and this behavior would cause subsequent searches to fail.

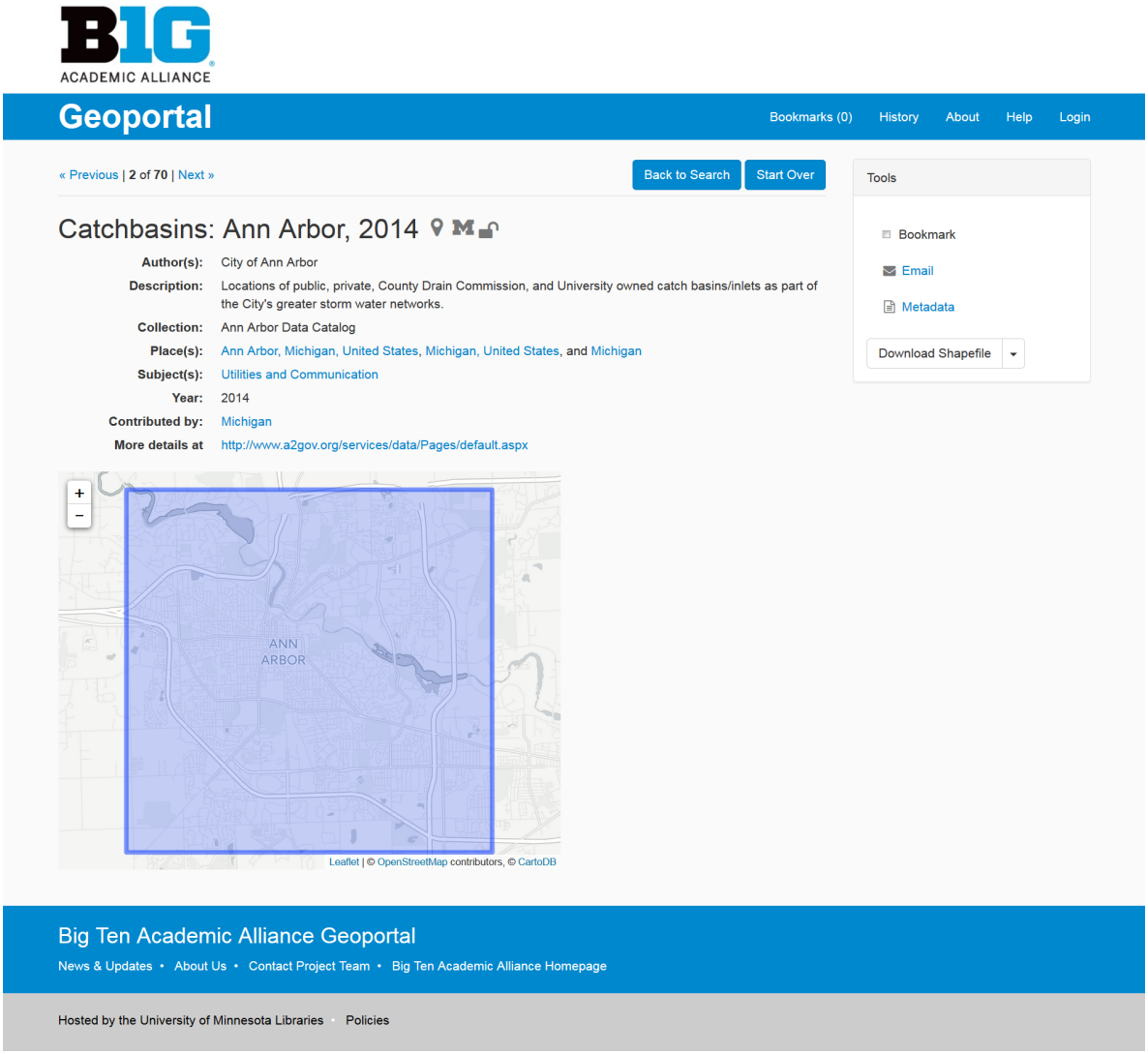


Screenshot of Results Page (Taken 4/14/2017)

Item Page Evaluation

When users click on a record, they enter the item page view with three sections: a list of metadata elements and values, a tool box with links for external metadata files, web services, and/or direct dataset downloads, and a map preview that shows bounding boxes, web service previews, or a scanned map image. Some users encountered challenges understanding these options, especially when any of the tools or map preview were missing. Users were especially confused by records that did not provide a direct download link and expressed annoyance when they realized that they needed to visit an external site to obtain the data.

The BTAA Geoportal is one of the few geospatial resource portals to combine both GIS datasets and scanned maps in the same application, bringing up another point of confusion for users. Several users misinterpreted the map preview feature and incorrectly concluded that the base layer displayed was the actual resource, instead of a basemap. As a result, some users could not discern if they had found a shapefile or a scanned map, nor did they realize there is a distinction.



Screen Shot of Item Record (Taken 4/14/2017)

Metadata

Users generally found the available metadata to be inadequate. They wanted to see more robust descriptions, as well as a feature catalog listing the attributes. Without this information readily available, several users expressed suspicion of the quality and provenance of the data. None of the users found the “metadata” link useful, because it displays a preview of the metadata in XML format. One user, upon seeing the metadata as XML, said “I know this is important, but I can’t make sense of it. I wish that there was something else here.”

Usage Analytics

The Interface Steering Group also examined Google Analytics reports to check for conflicts with their observations of the user tests. Although the site is still fairly new, many trends shown by usage statistics complement and reinforce what we learned from observing users. For example, Google Analytics shows that the vast majority of text searches are place name keywords. We can also see that users most frequently select only the top three facets on the results page and ignore the lower facets. Lastly, an analysis of the visited page URLs indicates that users are not taking advantage of the map to filter their results.

Recommendations for Site Improvements

User testing generated specific recommendations on the three main areas of the Geoportal: Homepage; Results Page; and Item Page; as well as changes to metadata.

Homepage	
1) Change highlighted facets to Subject, Place, Data Type.	Users struggled with the categories Institution and Collection. Those categories should be moved to the About page and replaced with Place and Data Type.
2) Change layout to feature the map search more prominently.	Users routinely missed the option to search using the map. Moving it further up the page and adding text that says “Search when I move the map” should help make it more visible to users.
3) Add a text search box within the map on the homepage, as well as the maps on the results page.	Using the map zoom feature only works if you already know the location of the place you are searching, which can cause problems. For example, test users weren’t necessarily familiar with the location of Ypsilanti, MI. Adding a text box would allow users to search for places like

	this and hopefully make the entire interface more accessible.
4) Put more suggestions on a failed search page	When a user typed a term into the search box that yielded no results, they did not know what to try next, and might have given up. A message giving suggestions for alternate spellings or to browse the facets could keep a user engaged to continue searching.

Search Results Page	
1) Make search options clearer on the top of the page.	Many users did not notice that their previously selected facets were “remembered” in the interface. Visual changes to the “Start Over” button and the search bar should make the search function clearer.
2) Reorder facets on the left facet menu, making the first four: Place; Data Type; Year; and Subject.	Users only click on the the facets listed first and ignore the ones lower down. Similar to observations from the homepage, users found Institution and Collection confusing. We recommended moving the listed facets to the top four spots because they were of interest to users and also the facets with the most cleaned up and standardized metadata.
3) Set year facet to chronological sort.	Users found this facet difficult because it displayed in numeric instead of chronological order. Chronological order would make selection more intuitive.
4) Add time slider for year facet.	This would further support searching by time period, allowing users to search within a timeframe instead of just selecting one year.
5) Set results page default to 20.	Many users expressed a desire for more results as the default to minimize having to load another set. While many users would prefer more results, 20 offers more results without distorting the map inset on the search results page.

Item Page	
1) Display human readable metadata.	Many users asked for metadata that was more easily understood than an XML format. More understandable metadata would assist the user's selection of appropriate data, as well as alleviate some suspicion of geospatial data.
2) Have a consistent download button/or substitute for download button.	Once users learned where to find the download button on the right side of the item page, the records missing a direct download button confused them. We should strive to have a download option whenever possible. When providing this is not possible, a substitute in the same place in the interface would help users.
3) Add text that indicates what is being shown in the preview box.	Many users did not understand what the map preview with a blue bounding box indicated, particularly those less experienced with GIS.
4) Include thumbnail for scanned map if International Image Interoperability Framework (IIIF) is not available.	Many institutions do not have IIIF, and their map records have only a bounding box in the preview window. Given the confusion about the bounding box previews, adding support to use a thumbnail preview for scanned maps could help distinguish them from geospatial data.
5) Include attribute table information, when available.	Users expressed the desire to see this information and indicated that it would help them identify that a resource contained the data that they need.
6) Add functionality for supporting documentation, such as a codebook, data dictionary, or other supporting files.	Many users wanted to find this information directly in the geoportal. While the primary purpose of the BTAA Geoportal is discovery and access, we also want to facilitate data use whenever possible. This is another step that may also help alleviate suspicion of geospatial data.
7) Add support of multiple download links (for scanned maps).	Geoblacklight defaults to allowing only one download link. Additional download links in the interface would allow for downloading of multiple sizes of the same image, as well as support georeferenced and un-edited scanned maps in the same records.

Metadata	
1) Normalize element values, including keyword capitalization, place names, and author/publishers.	With our current Solr configuration, “Inland Waters” and “inland waters” would not be grouped together, nor would “Philadelphia, PA” and “Philadelphia, Pennsylvania.” Rather than adding numerous “rules” to Solr, the best practice is to normalize the metadata before ingest.
2) Add synonym files to Solr to facilitate discovery.	This would enable a user typing in “bike” to also have results returned with the word “bicycle.”
3) Encourage contributors to submit robust entries into the description field.	Many users prefer to glean additional information from a condensed description field written in a narrative format, rather than sorting through elements.
4) Display the metadata in a human readable format, such as HTML.	The XML preview is not readable.

Reporting and Implementing Recommendations

Taking the next steps of reporting and implementing our recommendations requires an assessment of the extent of each of the changes and who will make them. Some changes will be implemented only to the BTAA Geoportal, while some will require development on the GeoBlacklight code base.

GeoBlacklight is open source software on GitHub, and the main developers welcome collaborative development. For our recommendations that require modifications to the source code, such as adding a text box to the map search or implementing a year slider, we will report them as potential “enhancements” to the GeoBlacklight GitHub Issues tracker. Other recommended changes, such as facet order or homepage design, fall under the category of customizations and should be made to our local installation only. Local changes are tracked within our own project’s public GitHub repository, where they can optionally be adopted by other GeoBlacklight users.

Conclusions, Remaining Questions, and Future Research

Many users repeatedly said that they would only feel confident about the data if they could download it and explore in a GIS application. This leaves us with the question of how the BTAA Geoportal, and geoportals in general, can alleviate this suspicion of geospatial data. While our recommendations, such as providing more readable metadata and providing a codebook, should help, this poses an interesting topic for future research into the user behavior of geospatial data users. This

was one area where the Institution facet helped, as some users saw this affiliation as being a sign that the data was vetted by the Institution and this made them feel more comfortable with the data.

Observing the search strategies across a variety of users revealed that the level of GIS experience appeared to have little to no effect on item discovery. Instead, success could be predicted based upon the level of experience in research, libraries, or even online shopping. Users who were already sophisticated searchers were able to creatively expand their strategies to complete the tasks, even when exposed to unfamiliar GIS terminology. In contrast, less experienced searchers found using the geoportal difficult, and might any type of catalog application challenging, regardless of the discipline. One instance where having a discipline knowledge of geospatial resources was helpful occurred when interpreting the map preview box, which, depending upon the resource type, will display either bounding boxes, web service overlays, or scanned images.

The BTAA Geoportal will continue to grow as the project adds more metadata records. We conducted our usability testing before adding many of these records. Notably, after completing the usability testing, the project added over a thousand metadata records for scanned maps from participating institutions' library collections. The project also plans to add records for licensed geospatial data at some point in the future, which would require authentication for authorized users. These additions will likely impact the user experience of the BTAA Geoportal.

To ascertain how implemented recommendations impact the usability of the of interface, as well as to evaluate the inclusion of additional types of records, we plan to conduct another round of user testing in the future. The project team already cleaned up many metadata problems and added many synonyms to Solr, improving much of the search functionality. After the BTAA Geospatial Data Project is able to incorporate some of the recommendations and the Geoblacklight community has an opportunity to consider some of the submitted GitHub issues, the Interface Steering Group recommends planning another round of usability tests.

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Appendix I: Test Tasks for Users with GIS Experience

Task 1: Find and download a map of Ann Arbor from the 1800s.

Task 2: You are researching the lakes within Minnesota. Find the approximate number of records that include information about lakes in Minnesota that are available.

Task 3: You are writing an article about Wisconsin Governor Scott Walker and want to include maps of who voted for him in the 2010 election. Find where to download this information.

Task 4: You want to make a simple map of all of the counties in Pennsylvania. Find where to download this information.

Task 5: You just moved to the city of Ypsilanti in Washtenaw County and you want to learn more about the area. Find the approximate number of records are available.

Task 6: You are working on a project where you want to overlay roads with aerial imagery in Hennepin County, MN. Find the aerial imagery and how to access it, then find the roads data and where to download it.

Task 7: You are researching the concept of environmental justice and plan to analyze census population demographics and access to public parks for the states of Indiana. Find where to download this information.

Appendix II: Test Tasks for Users without GIS Experience

Task 1: Find and download a map of Ann Arbor from the 1800s.

Task 2: You are researching the lakes within Minnesota. Find the approximate number of records that include information about lakes in Minnesota that are available.

Task 3: Your grandpa, Henry Jennings, family is selling their farm in Sperry Township, which is in Clayton County, Iowa. You think that they bought the property in 1910. Can you find a map of Sperry Township?

Task 4: You want to make a simple map of all of the counties in Pennsylvania. Find where to download this information.

Task 5: You just moved to the city of Ypsilanti in Washtenaw county and you want to learn more about the area. Find the approximate number of records are available.