Deep Blue: A Usability Assessment

Assignment #6
Heuristic Evaluation

by

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1. Executive Summary

This report contains a heuristic evaluation of Deep Blue, the University of Michigan's digital repository. Deep Blue provides a permanent, safe, and accessible environment for university affiliates to store, index, preserve, and redistribute a vast array of digital information including journal articles, datasets, audio and video files, images, and course-related materials.

The goals of this heuristic evaluation were to evaluate the usability of the system and to create a prioritized list of problems that should be fixed in the future revisions of the product with the developers of the system in mind.

Heuristic evaluation is an effective approach to uncover major flaws of a product in a short amount of time. It involves having a small set of evaluators examine the system and judge its compliance with recognized usability principles (the "heuristics"). For this evaluation, a checklist containing forty-six heuristics compiled by Mike Elledge and Panayiotis Zaphiris was used, along with their 1-5 scale.

This report describes the specific findings and recommendations that resulted from the heuristic evaluation. It highlights the good and bad features of Deep Blue in relation to its usability, functionality and aesthetics. The problem issues are presented with proposed solutions to help the staff of Deep Blue in making decisions on what changes to make given the site's strategic direction, available resources and constraints of the project schedule.

2. Deep Blue – The Product

2.1. Overview of Deep Blue

Deep Blue is a digital repository, designed to serve the University of Michigan's scholarly community in preserving its intellectual work. This initiative provides a long-term means for university students, professors, and staff to store their finished articles, unpublished works, and related datasets.

The project began in August 2004, with the adoption of D-Space, an open-source digital repository software jointly developed by the Massachusetts Institute of Technology and Hewlett Packard. Deep Blue is the University of Michigan's implementation of DSpace. Each DSpace service is comprised of communities – groups that contribute content to DSpace – and each community, in turn, have collections, which contain the content items, or files.

Currently, Deep Blue has only one community – University of Michigan, having two collections: College of Engineering and University of Michigan Transportation Research Institute (UMTRI). However, Deep Blue hopes to unveil its service to the

greater university through a widespread marketing campaign later this year. Presently, the Deep Blue staff is conducting presentation sessions to select university departments in order to foster interest and a collection base. In addition to these efforts, approximately a dozen collections are ready for public use and dissemination in Spring 2006.

Deep Blue allows its users to conduct a number of tasks including depositing items; searching; browsing communities and collections, titles, authors and by date; editing profiles; and subscribing to email notifications for collection updates. In order to deposit a document, edit profile or subscribe to email notifications, users must log in to the system. Users are authenticated using their Kerberos password like other web-based University of Michigan applications. Figure 1 shows the home page of Deep Blue.

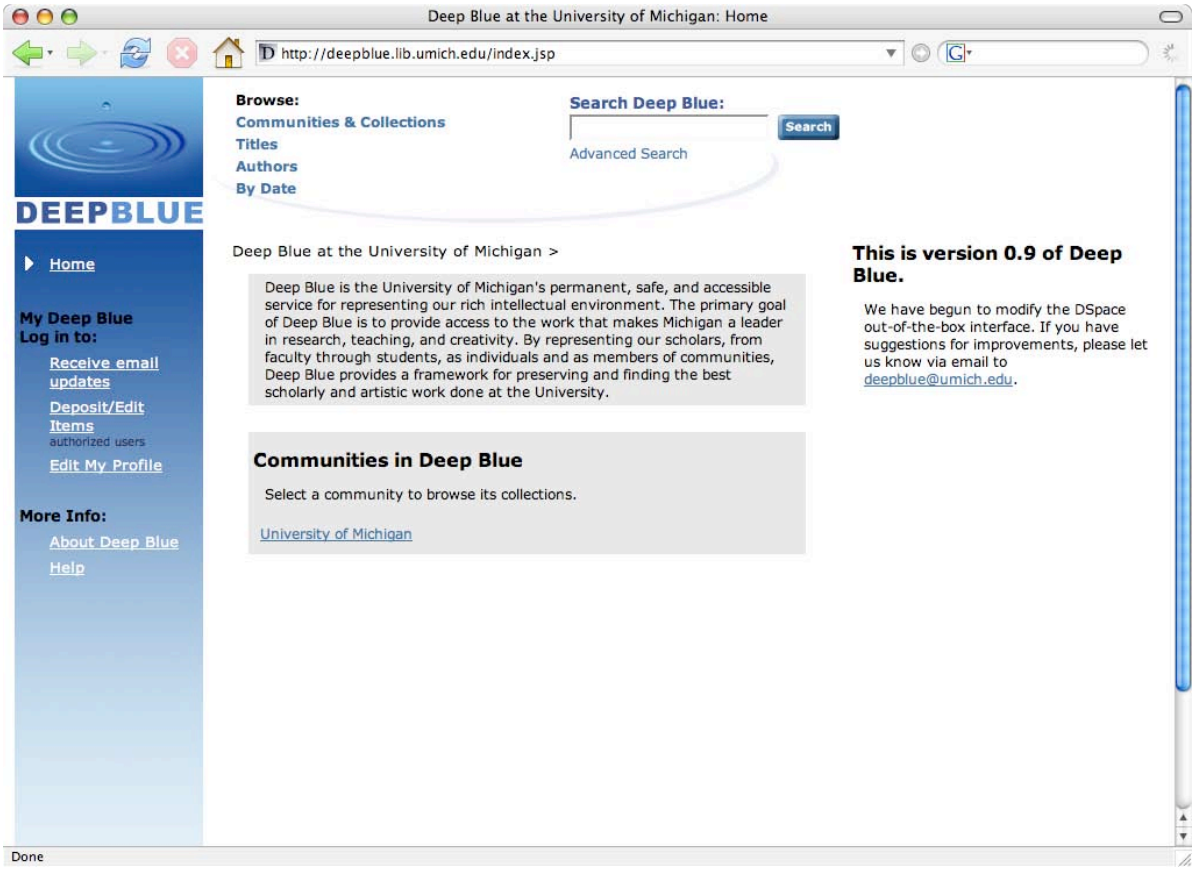

Figure 1 Deep Blue - Home Page

Deep Blue is committed to ensuring the lasting preservation of the scholarly and artistic work done at the university by encouraging formats technologies that will enable reliable data migration and future format upgrades for a variety of systems and platforms.

2.2. Target Audience

Deep Blue is provided to the faculty, staff and students as part of the University of Michigan scholarly community. Yet its main target audience is the faculty, as they do most of the academic research. Staff members and students might also deposit items into Deep Blue; but staff members are not copyright owners, and it is not common for students to deposit items since the rules regulating copyrights of academic research done by students are stricter.

3. Heuristic Evaluation

3.1. Evaluation Goals

This document describes a heuristic evaluation of Deep Blue. The evaluation was designed and conducted as a part of a group project for the course SI 622: Evaluation of Systems and Services, taught by Professor Judy Olson. The goal of this heuristic evaluation was to quickly uncover Deep Blue's major usability problems.

The following section briefly discusses the heuristics and rating scale along with the methods that were used to administer the heuristic evaluation. Next, findings, including the success and problem areas, are explained. Finally, a summary highlighting good and bad features of Deep Blue is presented.

3.2. Methodology

3.2.1. Heuristics and Rating Scale

Heuristic evaluation is a method of usability assessment in which a group of evaluators critique the interface of a product, service or website based on a pre-determined set of usability criteria. The goal of this critique is to uncover the imperfections of the interface in terms of the user.

Nielsen & Molich (1990) cite the following as advantages of heuristic evaluation:

- It is cheap.
- It is intuitive and easy to motivate people to do it.
- It does not require advance planning.
- It can be used early in the development process.

The type and quantity of heuristics used in evaluations vary; some lists consist of thousands of usability guidelines while others limit themselves to a few key areas. This study employed forty-six usability heuristics, a combination of heuristics from Olson and Nielsen collected by Mike Elledge and Panayiotis Zaphiris. The

categories in which these heuristics are grouped into are shown in Table 1 below. The complete list of heuristics utilized in this evaluation is given in Appendix A.

#	Heuristic Category
1	Consistency
2	Correspondence
3	Error Recovery
4	Feedback
5	Help and Documentation
6	Memory Load
7	System Response Time
8	Training
9	Visual Display

Table 1 Heuristic categories

Nielson & Molich advocate using an aggregate of evaluators by having a group of evaluators critique the interface and then combining their findings into a larger report. Evaluators should work independently of one another to gather findings, comparing results only after the evaluation has been completed. Otherwise evaluators risk biasing one another to a certain method of heuristics evaluation. Aggregated individual heuristic evaluation uncovers the greatest breadth of usability problems (Nielsen & Molich, 1990).

For our evaluation of Deep Blue, we used pre-constructed personas to base our actions. The system was evaluated against each heuristic by all of the evaluators. The severity of issues were ranked using the rating scale shown in Table 2, adapted from the rating scale Mike Elledge and Panayiotis Zaphiris included in their checklist document.

Rating	Term	Description
1	Poor	This feature is extremely confusing and prone to catastrophic failure of the feature and/or site.
2	Fair	This feature is slightly confusing but the user could work around or adapt to the problem.
3	Average	This feature is initially confusing, but the user will adapt and overcome this problem with time.

4	Good	This feature is clear and works fine.
5	Excellent	This feature is immediately obvious and works well.

Table 2 Rating scale used in heuristic evaluation of Deep Blue

Utilization of this rating scale for evaluation of the system against all heuristics helped us achieve consistency.

3.2.2. Scenarios

For our evaluation of Deep Blue we used three different personas, performing five different tasks. While one evaluator "played" the part of the persona, the rest of the group noted any deviation from the established heuristic criteria. The group rotated role-play and observation duties throughout the three-persona evolution.

The personas and scenarios used in the heuristic evaluation of Deep Blue are summarized in Table 3. Detailed personas are included in Appendix B.

Role	Played by	Scenario
Wilhelm Gangloff Economics Professor	Jodi Tyron	(1) Search for friend's paper (2) Upload existing MS Word document
Inara Reynolds, Systems Administrator	Mark Bard	(3) Is given a file to upload by a professor. (4) Wants to edit metadata after discovering an error.
Hua Yang, PhD Candidate	Ayça Aksu Erkan	(5) Browse Collections

Table 3 Personas and scenarios used in heuristic evaluation of Deep Blue

At the conclusion of the role-play period, the group complied and reviewed each other's notes. During this review and comment period, the group determined the scope of each problem area and assigned the problem-level rankings for the eight problems.

4. Findings

4.1. Success Areas Summary

During the group's evaluation testing, Deep Blue has satisfied several heuristics swimmingly. We believe that these features of Deep Blue should remain intact in the future versions of the product. The successful features are presented in Table 4 and then briefly discussed below.

#	Successful Feature	Severity	Heuristic Category	Specific Heuristics Satisfied[1]
1	Deep Blue responses promptly to page requests.	5	System Response Time	Olson #18, #19
2	Information entered by user during deposit is saved automatically at each step.	5	Error Recovery	Olson #22
3	Related commands are grouped on the menus. Related items are grouped spatially.	4	Menu/Command Structure; Visual Display	Olson #8, #10, #16

Table 4 Summary of success areas

During the evaluation test, Deep Blue responded quickly and promptly to search requests, Help menu requests, and general page requests. We appreciate Deep Blue's speed and want to remind that system response time should continue to be good in the future too, when there is more than one community with two collections.

We find the automatic save feature of Deep Blue invaluable; rather than resubmitting all the metadata again, Deep Blue's automatic saving allowed the group's persona to continue adding metadata after an unrelated computer crash. The group was impressed by this error-prevention mechanism despite the problems with Deep Blue's metadata entry component.

As a thumb of rule, the users should know where (on which page) they are and where they can go from that page. Deep Blue satisfies this heuristic via the use of breadcrumbs, the logo as a link to the homepage, and the static menu along the left-hand side with associated arrow. Yet there is a little bit room for improvement here; the developers may reconsider the structure and appearance of the global navigation bar and solve other minor navigation problems.

[1] As noted in Professor Judy Olson's February 7, 2006 Lecture Notes

4.2. Problem Areas Summary

As summarized in Table 5, the group's three-persona heuristic testing revealed seven problems. Issues are ranked in the order of severity, Level-1 being catastrophic, Level-2 being critical, and Level-3 being general. References to both specific heuristics violated and broader categories these heuristics are grouped into are presented in the table. Each issue is discussed in detail in the following section of the report. Although the grouped compared Deep Blue against all heuristics during the evaluation testing, only the ones that are violated – according to all evaluators - are listed in this report.

#	Issue	Severity	Heuristic Category	Specific Violations[2]
1	Help consists of a single, long document and lacks keyword searching	**1**	Help and Documentation	Olson #25, #28
2	Unable to edit items after submission	**1**	Error Recovery	Olson #22, #23
3	Metadata field definitions do not exist; user unsure if data is applicable.	**2**	Training	Olson #26, #27, #28
4	Search interface and results	**2**	Visual Display	Olson #8, #11
5	Accessibility problems	**2**	Visual Display	Olson #7
6	Inconsistent labeling	**3**	Correspondence	Olson #1, #2
7	Navigation problems	**3**	Consistency; Correspondence; Visual Display	Olson #6, #8; W-2b

Table 5 Summary of problem areas

[2] As noted in Professor Judy Olson's February 7, 2006 Lecture Notes

In terms of the catastrophic problems, the current implementations of the Help menu and the users' lack of the ability to alter a document after submission present usability issues. The report explores these issues in more depth in subsequent pages, but it is worth to note here that the severe nature of these errors is twofold.

First, the user has significant difficulties understanding the system while using these features. Second, these problems present a potential fundamental and fatal flaw in the application's mission and intended use. Deep Blue relies on positive network externalities for success, the more people who upload, the greater the potential for future triumph. However, if users ignore or misuse metadata fields and lack the ability to change metadata after submission; then Deep Blue's search accuracy is hurt, and its value to users diminishes. Similarly, if the Help menu is difficult to navigate, hard to read, or lacks quick accessibility, then users have minimal support and little reason to use the site. In other words, if the metadata that fuels search queries and the help menu to assist users are both flawed then Deep Blue is deep-sixed. These catastrophic problems should be given first priority and they should be solved as soon as possible, resources permitting.

The heuristic evaluation revealed three critical problems about the user interface and accessibility of the site. Although these problems are not catastrophic, to solve them would enhance the usability of Deep Blue to a great extent.

Deep Blue may be impaired by solving two additional – though non-critical – problems related to visual display, menu or command structure, and Deep Blue's use of labels. If Deep Blue wants to overcome the problem of critical mass, it should function perfectly, which requires the solution of these general problems.

The next section of this report explores all of the problems discussed above in further detail.

4.3. Specific Problem Areas

4.3.1. Help Menu

Specific Heuristics Violated:

Olson #25 – Help should help. It should be written specific to the context in which the help was requested. It should be written sensitive to the task the user was engaged in.
Olson #28 – Documentation should be accessible through a good keyword index (in the user's vocabulary) and through tabs, headers, and a table of context that makes the grouping of functions obvious.

Details:

Deep Blue provides users help through a pop-up window that appears after clicking "Help" on the lower left side of any Deep Blue page. While the omnipresent ability to seek help from Deep Blue is commendable, the pop-up window contains multiple flaws. If one were to copy, paste, and printout the content of the Help window, it would be approximately 16 pages of text and links. It is a single, long document, lacking search functionality.

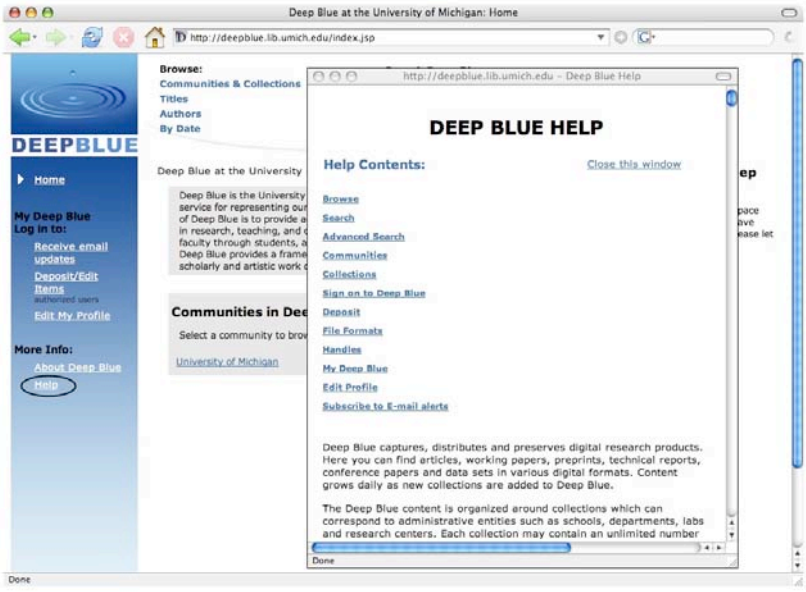

Figure 2 Pop-up help window

To its credit, Deep Blue offers a one-level linked table of contents on the opening Help page. However, if users have specific term or vocabulary questions, Deep Blue offers no search mechanism for quickly finding those keywords and answers. The group's personas relied on the browser application's built-in Find capability (Ctrl-F) to search the content of the Help menu. Another problem is that help menu consists of the tasks users can perform (e.g. deposit) and the objects in Deep Blue (e.g. handles) together, the division of topics is not clear.

Proposed Solution:

Ideally, help documentation should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large. A solution for Deep Blue's help menu problem would be to provide a more detailed table of contents that would include multiple level of headings and index for help documentation along with search capability. This way, usability of help documentation would improve to a great extent since this contents-index-search structure is well known among help systems. If Deep Blue organizes its help content in this well-known way, it would be much easier for new users to learn how to use the system.

4.3.2. Unable to Edit Items After Submission

Specific Heuristics Violated:

Olson #22 – All actions should have a natural reverse, accessed through an "undo" command.
Olson #23 – Actions that have severe consequences should be prompted with "are you sure?"

Details:

Whenever a user deposits an item into Deep Blue, he must submit document metadata along with the file. Once the item is deposited into Deep Blue, there is no way to edit the record of the item or remove the item. Even though there is a menu item called "Deposit/Edit Items" in the left navigation bar, currently users are only able to deposit items, not edit the metadata associated with the item or remove them from the repository. Moreover, the system doesn't ask for confirmation before the final step of deposit and doesn't warn users about the fact that their action cannot be taken back (document cannot be removed).

Presently, Deep Blue relies on only a portion of a record's metadata for its advance searches—namely author, title, subject, abstract, series, sponsor and identifier. Successive versions of Deep Blue could make more extensive use of the record fields for searching or linking making the system more vulnerable to erroneous metadata.

Proposed Solution:

The deposits that are successfully entered into the Deep Blue system go through the workflow process designated for the collection to which they are deposited. Some collections require the deposit to go through editing or review steps, while others may immediately accept the deposit. Depending on the policy of the specific collection, Deep Blue should allow either the author(s) of the document or administrators of the collection, or both to fix flawed metadata after a document upload. This is crucial for the successful operation of the system not just a major usability problem.

4.3.3. Metadata Field Definitions

Specific Heuristics Violated:

Olson #26 – Training should be specific to the tasks the user is most likely to be engaged in.
Olson #27 – Documentation explains both what the functions are in the system and how to use them in common tasks.
Olson #28 – Documentation should be accessible through a good keyword index (in the user's vocabulary) and through tabs, headers, and a table of context that makes the grouping of functions obvious.

Details:

When an administrator deposits an item to Deep Blue, s/he must submit document metadata along with the file. While the Describe, Upload, Verify, License, and Complete tabs are helpful, the use of two Describe tabs is confusing (See Figure 3).

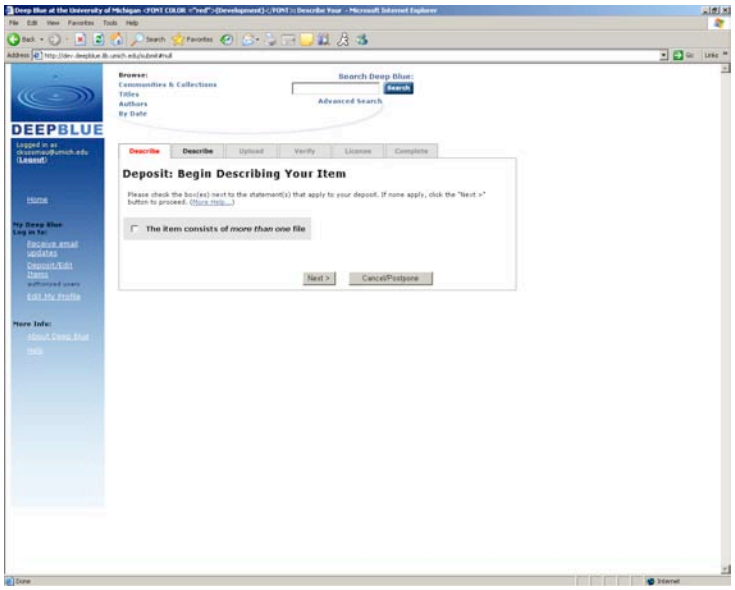

Figure 3 Deposit screen, first tab

As illustrated in Figure 4, the user faces a long metadata entry screen (14 fields) with minimal on-page assistance. To its credit, Deep Blue does offer metadata definitions in its pop-up Help Window, but managing a pop-up window with the metadata entry screen may lead to a cluttered computer desktop.

Conversely, the use or utility of the Abstract field vis-à-vis the Description field is vague; what is the function of the description field if the abstract is complete?

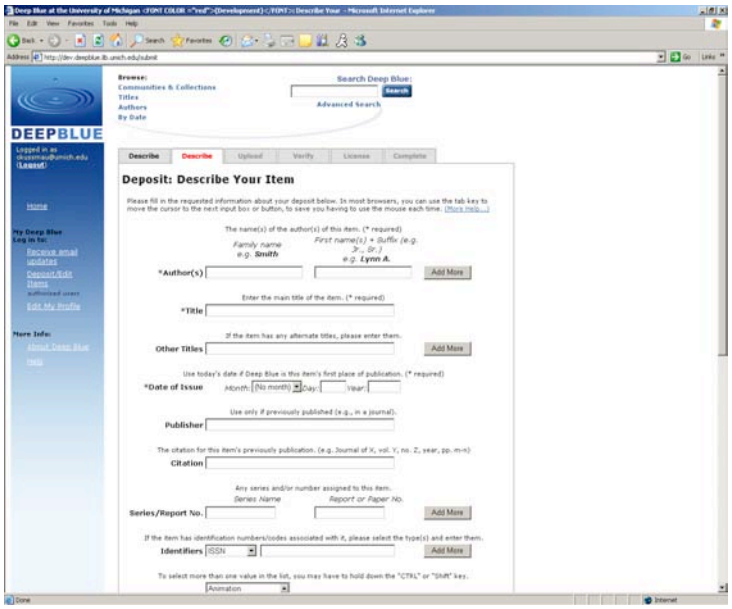

Figure 4 Deposit screen, metadata entry

The most devastating example of a lack of on-page assistance resides in the Keyword fields. Without an implemented controlled vocabulary, the subsequent document search by keyword will have severe accuracy problems.

Proposed Solution:

A solution would be providing contextual clues about a particular field when users point their mouse to that field. These hints could be presented in small windows, as layers of HTML instead of pop-up windows. They would naturally disappear as the users move their mouse. This solution wouldn't increase the load on the user since there would be no pop-up windows involved. On the other hand, it would help guiding users better during their experience with Deep Blue.

One other recommendation is using just one 'Describe' tab instead of two. Although this is a minor issue, it was confusing for our persona during the evaluation testing. The first 'Describe' tab only contains a checkbox to see if the item contains more than one file. This can be easily moved to the second tab of the Deposit screen.

4.3.4. Search Interface and Results

Specific Heuristics Violated:

Olson #8 – Related items should be grouped spatially; unrelated items should be separated.
Olson #11 – Display familiar items in familiar ways.

Details:

When browsing or searching for documents by title or author, our personas uncovered an annoying tendency for results to be displayed in counter-intuitive ways. For example, Hua, our graduate student persona, decided to browse titles starting with the letter H. So, she clicked the H along the "Jump to" menu only to discover that the first three entries started with the letter G. As illustrated in Figure 5, her initial concern dissipated once she looked further down the screen and realized that the H titles were present. Admittedly, this is a minor inconvenience, but potentially distressing to first-time users.

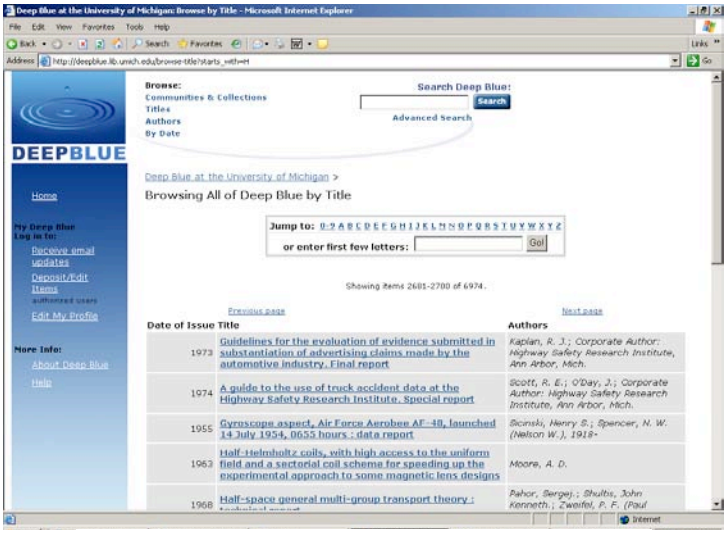

Figure 5 Browse by title

More troubling is the inability of users to sort a results list. For example, the screenshot at Figure 6 is a typical results screen with approximately 10 subsequent pages of results. At present, there are no means to sort results by any field. In other words, if a user searches for "crash" and then decides that he wants to sort the results by date (either ascending or descending), there is not means to accomplish this objective.

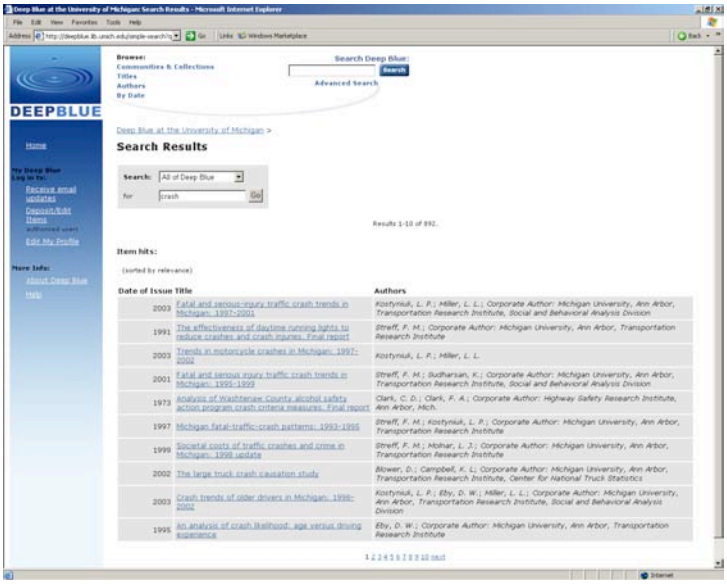

Figure 6 Search results

Another interesting finding about the usability of the search interface is that the system prints "1" on the screen when the search produces no results. This situation is illustrated in Figure 7 below.

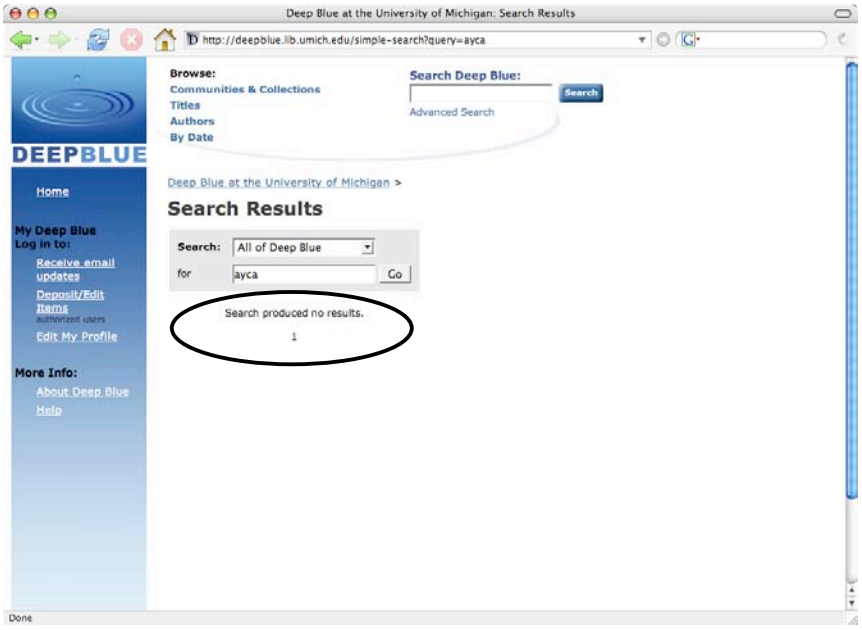

Figure 7 An unsuccessful search

Proposed Solution:

Instead of displaying search results as pre-determined chunks, Deep Blue should display only related results. It might be necessary to change the entire search system to achieve this, maybe even the information retrieval component that brings the results from the database. A more feasible solution, requiring changes only in the code that displays results, would be placing spaces between chunks of similar results. This way, related items would be grouped spatially.

A search system lacking feature sorting is not really usable. Users must be provided by some means of sorting the search results to find what they are looking for easily. Sorting by date, author and title can be implemented as beginners. The addition of sorting feature can be done without altering the existing search component.

Finally, when users get no search results, they shouldn't see a "1" on the screen. Further, the message "search produced no results." should be put above the search box so that it would be more visible.

To sum up, Deep Blue should have a search interface that is similar to standard search interfaces, displaying search results in familiar ways with necessary sorting functionality if it wants to be sticky.

4.3.5. Accessibility Problems

Specific Heuristics Violated:

Olson #7 – Readability of fonts increase if they are presented in both upper and lower cases, serif fonts, variable width strokes, and with appropriation separation.

Details:

A frequent and immediate complaint among the personas was the small font used throughout Deep Blue. This typeface of Verdana at size 10 px is fixed through a style sheet; any attempt to increase the font size through the browser's tool is futile. This issue was most distressing to Wilhelm, our retiring professor persona, and suggests a broader problem. Moreover, the background and foreground colors didn't always contrast sufficiently with each other, making it harder to see the text.

After the evaluation testing, we checked the main page of Deep Blue for accessibility issues using WebXACT, a free online service that lets users test single pages of web content, just to see if there are any obvious accessibility issues. The result of the evaluation is that "Deep Blue's main page does not comply with all of the automatic and manual checkpoints of the W3C Web Content Accessibility Guidelines, and requires repairs and manual verification". Indeed, WebXACT gave the error "Use relative sizing and positioning, rather than absolute." for the font size issue discussed above. There were other errors about form controls, usage of 'LABEL' and other HTML tags and elements and a warning for the contrast between the background and foreground among others. The issue of contrast is important when users view the site using monochrome displays or when users who have difficulty seeing certain colors view the site.

The good news is that the errors WebXACT gave all belonged to either Priority 2 or Priority 3 category of W3C Web Content Accessibility Guidelines. Still, it is important for Deep Blue to resolve these accessibility issues and maybe acquire an accessibility policy as an institutional repository that represents the university.

Proposed Solution:

The use of relative size and position units is important for two broad reasons: web content should be able to flow into differently-sized viewing areas, and users may need to change the size of all text on a page due to various reasons including visual impairment. For this reason, instead of defining a base font size in pixels, Deep Blue should use percent, "em", or "ex" values in its style sheet. Additionally, developers of Deep Blue should ensure that foreground and background color combinations provide sufficient contrast when viewed by someone with color or contrast perception problems.

4.3.6. Inconsistent Labeling

Specific Heuristics Violated:

Olson #1 – The terms the software application uses should be as close as possible to the words users normally think of in conducting the task.
Olson #2 – If new words must be used, they should be *metaphorical* and *concrete*.

Details:

During our evaluation testing, we noticed several inconsistencies in terminology Deep Blue uses. To begin with, during role-play, each persona was confused about the community/collection concept that is fundamental to Deep Blue. This is a common problem with utilizing library or archival terminology with the larger public. While the term and implication of a "collection" is clear to archivists and librarians, the use of "community" remains a vague concept for the users.

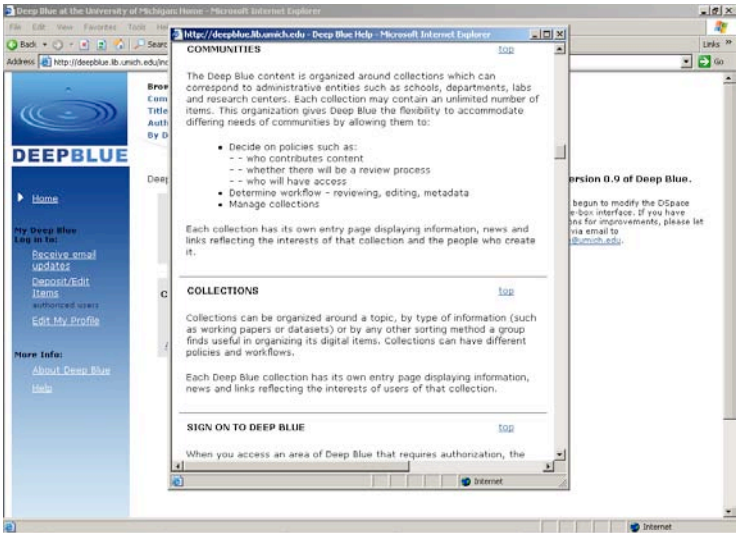

Figure 8 Pop-up Help window, Communities

The pop-up Help window shown in Figure 8 attempts to define the scope of communities and collections, but Deep Blue never explicitly defines a community. Rather, the application discusses communities in terms of multiple collections.

Similarly, there is confusion about the usage of persistent URL and handle. Handles are briefly explained in the Help documentation but there is no explicit definition. Users only learn that "When your item becomes a part of the Deep Blue repository it is assigned a persistent URL." They don't necessarily infer that a handle and a persistent URL is the same thing. Further, "About Deep Blue" document does not contain information about handles/URLs at all.

Another possible source of confusion is the usage of "receive email updates"/"subscribe to collections"/"subscribe to e-mail alerts" for the same action of signing up for daily emails about collection updates in left menu, "Your Subscriptions" page, and help documentation respectively.

Proposed Solution:

It may be too late in the developmental process to swap communities/collections for another set of terms, such as file cabinet and folders. While this change would provide a concrete metaphor and approximate working terms for faculty, staff, and librarians, the most feasible solution would be to better define communities and collections on the home page as well the Help documentation. There is ample space on the home page to cite an example so that users can more effectively grasp the abstract file order structure of Deep Blue.

In the same way, it should be better explained that the handles and persistent URLs are the exact same thing in Help documentation and their importance for Deep Blue and its users should be better communicated in "About Deep Blue" document. Little contextual clues that show up when users point their mouse to the label "Persistent URL" might be useful here too.

Deep Blue should stick to the same terminology across all pages. If Deep Blue is consistent in presenting its content, then it becomes more predictable and easier to learn for new users. This is especially important for first-time visitors to Deep Blue, but consistency benefits all users to the site. Moreover, Deep Blue should provide the documentation about the fundamental concepts it relies on such as communities, collections, handles etc. since these are not obvious to users.

4.3.7. Navigation Problems

Specific Heuristics Violated:

Olson #6 – The closer the command structure is to the structure of commands in other well-known applications, the easier the new one is to learn.
Olson #8 – Related items should be grouped spatially; unrelated items should be separated.
Walk-through Evaluation List 2b - Obvious that action is appropriate to goal?

Details:

Despite the use of static menus and breadcrumbs, the evaluation team came across couple of problems preventing successful navigation during the evaluation testing of Deep Blue. The first one of these problems is about the way users log in to Deep Blue. This problem is twofold. First, there is no login form or link on the main page of Deep Blue. When users want to perform tasks requiring that they log in, they are redirected to the login page common to all University of Michigan web-based applications. After they log in using their Kerberos password, users are taken to "Deposit/Edit Items" page no matter what page they requested before logging in. Complicating the situation further, this page is called "My Deep Blue" and it serves as the personalized page for users although the link to it says "Deposit/Edit Items". When users log-out, they log out from all UofM web-based applications. One can argue that this is what UofM users are accustomed to. But we believe this navigation structure might decrease usability of Deep Blue.

Another issue about navigation came up when our graduate student persona, Hua, expected to browse the collection by clicking on its name. However, in the response page, she got the advanced search interface with three buttons to browse titles, authors, and by date (See Figure 9). This action doesn't correspond to her goal, reducing the usability. Note that the regular advanced search interface doesn't have the circled buttons.

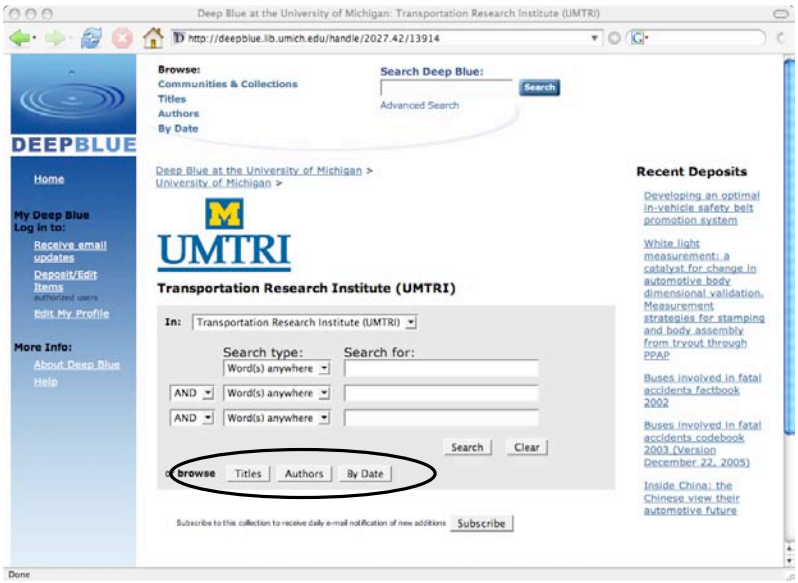

Figure 9 UMTRI collection

The interface displayed in Figure 9 illustrates the violation of another heuristic, one that recommends unrelated items be separated.

One very minor navigation issue in Deep Blue is that it doesn't provide the users with a site map or site index. Currently this is fine since the site is small. But developers of Deep Blue should keep in mind that in the future, when it has much more content and additional features, the site might need a site map or a site index to help users navigate better.

Proposed Solution:

Providing a regular log in form like other well-known applications might be useful in terms of increasing usability. Even if Deep Blue doesn't change the way users log in to the system, it might provide a login link on the main page or better yet on left menu bar for users who want to use features exclusive to registered users. Additionally, Deep Blue must keep track of page requests requiring login and redirect users to corresponding pages instead of redirecting to "My Deep Blue" page by default.

During the evaluation testing, our persona expected to browse the collection when she clicked on the name of the collection. She realized that it is the collection's home page because she saw the icon. But, she expected to see the actual items in the collection, or at least some information about the collection. There was some information about the collection but it was below the visible area. She needed to scroll down to see that information.

Users should be able to understand what they can do on a particular page. Instead of a big icon for the collection, the first thing she needs to see is the information about it. Users should also be guided better by information about ways to browse or search the collection. Then users can be pointed to corresponding interfaces.

Since browse and search are two different actions, the circled buttons in Figure 9 above should not be in the gray advanced search box. Instead, they should have their own box. This way, related buttons would be grouped spatially.

5. Summary

The heuristic methodology and analytical approach applied to Deep Blue provided both positive and negative results. Deep Blue was especially successful in responding to requests promptly. It also impressed the evaluation team by automatically saving data entered during document deposit after a computer crash. Another good feature is the usage of a standard template and menu structure for all pages. Moreover, the related links on the top and left menu bar are grouped. Deep Blue helps its users find their way around the site using breadcrumb trails. The use of breadcrumbs serves two purposes: it shows users where they are on the site and offers shortcuts to jump to previous categories without using the Back button of the browser. We praise Deep Blue staff for these product features.

In addition to these features, Deep Blue could take its usability to a much higher level by making changes, most of which may not require so many resources. The evaluation team concluded that, overall, Deep Blue users can be guided better and task progress can be communicated more clearly using more visible feedback messages and the like. Moreover, Deep Blue has some issues with the distribution of content areas on the screen and navigation around the site.

The conclusion regarding better user guidance was reached after observing each one of our personas confused about the terminology of the site or which action to take at some point during the evaluation testing. On the "Edit Your Profile" page, for example, there is a form for updating one's profile including name, telephone and password. But there is confusion about whether submitting the form changes a user's Kerberos password or just the password for Deep Blue. At other times personas were not confident on whether they are entering the correct information. Compounding this problem is the lack of adequate feedback. For example, after users subscribe to a collection, the page changes a little bit and a tiny success message is displayed near the bottom of the screen. One recommendation for improving feedback is the addition of status bar for uploading documents.

It cannot be said that Deep Blue uses screen real estate effectively. For example, information about the collections is displayed at the bottom of the page. Our personas had to scroll down to see it. The icons of the collections are big and they are displayed above the huge advanced search box. The usage of global navigation bar is a good practice. However we think it needs redesign.

Developers of Deep Blue should preserve its good features and correct the bad ones in the upcoming revisions of the product. We hope this report presenting a prioritized list of issues help them in their efforts. In addition to helping developers, this report will help our evaluation team conduct future user testing.

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Appendix A – Heuristic Evaluation Checklist

Usability Checklist
Mike Elledge and Panayiotis Zaphiris

Characteristic	Measure	Scale	Comments
Consistency	Actions (O) Back-up (O) Format (O) Obvious Action Available (W-2a) Obvious Goal Revision (W-6a)		
Correspondence	Action Corresponds to User Goal (W-2b) Natural Order for Tasks (O) New Terms Metaphorical & Concrete (O) Simple & Natural Dialog (N) User Terms/User's Language (O/N) User's Goal Described (W-1)		
Error Recovery	Avoid Modes (N) Clear & Instructive (O)/Good Error Messages (N) Double Check Critical Operations (O) "Undo" Capability (O)		
Feedback	Clear Progress toward Goal (W-5a) Needed Information Provided (W-5b) Obvious Task Completion (6b) Response Time (N) System Failure (N)		
Help and Documentation	Documentation Accessible (O) Documentation Explained (O) Help Accessible Everywhere (O) Help and Documentation Provided (N) Help Context Sensitive (O)		
Memory Load	Minimize User Load (N)		

1

Usability Checklist
Mike Elledge and Panayiotis Zaphiris

Menu/Command Structure	Clear Instructions Provided (O) Clearly Marked Exits (N) Frequently Used Commands Accessible (O) Other Actions Less Appropriate (W-3) Problem-Free Execution (W-4a) Related Commands Grouped Together (O) Short Cuts (N) Simple/Advanced Options (O) Verb/Object/Modifier Sequence (O)		
System Response Time	Computed Response (2 sec) (O) Keystroke/Mouse (100msec) (O) Time alerts (O)/Response Time (N)		
Training	Training for Typical Tasks (O)		
Visual Display	Error Messages (O) Familiarity (O) Less is More (N) Proximity (O) Readability (O) Screen Areas (O) Similarity (O)		

KEY

O = Appears on J. Olson Checklist
N = Appears on J. Nieslen Usability Heurisitcs list
W = Appears on Walk-through Evaluation list (paraphrased; question # shown for reference)

SCALE

1 (Poor), 2 (Fair), 3 (Average), 4 (Good), 5 (Excellent)
Scale based on user comments, personal observation, competing sites, published literature.

Appendix B - Personas

Persona #1: Wilhelm "Wil" Gangloff

Background:

- 70 years old, widowed male
- Born in Vienna, Austria, and immigrated to Dayton, Ohio in 1950. Became an American citizen in 1963.
- Earned a PhD in economics from Stanford (1964)
- University of Michigan Professor of economics (1965-present)
- Interest in history and economics of post-war reconstructions in Germany, Japan, and South Korea
- Estimates he has published 75-100 papers in German and English, "but most of them were rubbish"
- Salary: $93,000 a year, but income will be fixed upon retirement

Tastes and Preferences:

- Plans to retire in the next three years (depending on departmental hiring) and spend more time with his grandchildren in the Chicago suburbs
- His wife, Carolyn, died two years ago
- Commutes to the office and around town on his bicycle
- Owns a 1999 Volkswagen Jetta, but only drives it to get groceries
- Listens to jazz and is especially fond of Thelonious Monk
- Ardent soccer (football) fan – his son played in college and professionally in Italy
- Hoping to sell his house and move to University Commons by Spring 2007

Technological Skill:

- Bought the same model Dell PC that the University provides its professors
- Computer and Internet literate, but still tentative "Like a fawn staggering to its feet"
- Enjoys emailing friends in Europe, Japan, and United States
- Enjoys reading online German newspapers and downloading European radio shows
- Uses his Lorch Hall office Internet connection for Web connection
- Has dial-up access at home, but rarely uses it
- Relies on rote procedures for accessing email and sites or downloading radio shows

Deep Blue Needs/Concerns:

- Intrigued by digital repository concept
- Thinks he has the hard copy of drafts, but doesn't know how to scan
- Wants to contribute and willing to learn how to upload and scan

- Worried about "yet another system to learn"
- Concerned about copyright

Persona #2: Inara Reynolds

Personal Profile

Inara grew up in Japan before attending the University of Michigan to obtain a computer science degree. After graduation, she married an economics major that tutored her in Econ 101, which allowed her to stay in the country. She has worked for the University in various capacities since graduation. Recently, her department has decided to deposit items into deep blue and she has been assigned the task of depositing items into the system. Professors or other staff will send the items to her, and she uploads them to deep blue, using the form provided by Deep Blue staff to deposit the item. She has never used a repository to store items and sees little value in depositing items that she has created, since she provides them for download off of her website. However, she might decide to deposit her items at a later date, if the system reaches a critical mass. As a user, she would like a subscription-like email to receive notice when papers of interest to her are added to Deep Blue.

Background

- 30-year-old, married, woman
- Received a BS in Computer Science and is working on a Masters in Business Administration in the evenings
- Manager of a computing services at one of the departmental units in LSA at the University of Michigan
- Has gained a few years of experience and is ambitious
- Has presented at conferences on on-campus computing services and has published a few articles.

Attributes

- Young
- Advanced internet user, runs her entire life online, including email, online MBA program, pays bills, on-line shopping, runs her own blog, reads ebooks in spare time, etc.
- Advanced computer user. Adapts to new programs easily.
- Has used on-line repositories to retrieve information for personal research.
- Non-native speaker of English. Fluent in Japanese and French. Some familiarity with Spanish.

Computer/System needs

- Ability to customize the interface herself
- Flexible metadata to allow customization for her department
- Obtain critical mass to see value of using repository to store her materials

Persona #3: Hua Yang

Name:	Hua Yang
Gender:	Female
Age:	32
Education:	MS in mechanical and electronic engineering
Occupation:	PhD Candidate
Marital Status:	Married
Income:	Less than $25,000
Country of Origin:	China
Race:	Asian

Summary:

Hua is a young and energetic PhD candidate in Mechanical Engineering Department at the University of Michigan, Ann Arbor. Her background is in mechanical and electrical engineering. She is studying mechatronics – the interesting combination of mechanical engineering, electronic engineering, and software engineering. She thinks the significantly low female presence in the field is an important problem. She is a bright and ambitious researcher and she wants to pursue an academic career in the United States. She already has authored and coauthored five academic papers. She is actively using University of Michigan's journal subscriptions for her research.

In the mornings, Hua sometimes attends seminar classes. In the afternoons, she usually works at the mechatronics research lab. She also works from home most nights. Although she saw a computer the first time in collage, she is an advanced computer and Internet user. She frequently uses Mathematica, Stata, and Latek for her research. She also knows a little bit MySQL and does some programming. She is always connected to the Internet when she is using her computer. She communicates with her family in China using instant messenger and Skype.

Hua lives in North Campus family housing. She walks to her office. She has a 98 model Toyota Corolla that she uses mostly for grocery shopping at the weekends. She is married to Zhu, a PhD candidate at Computer Science department. They don't have children. She is planning to give birth to her first child by the time she finishes her PhD.

Goals:

- Find credible sources
- To be able to do efficient federated search over specific topic
- Find up-to-date resource