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Article

Measuring Usability in the Database Review Process: Results From a Pilot

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Abstract

The objective of this study is to examine the impact of incorporating user experience study methods into library database purchase and renewal. Purdue University Libraries introduced a heuristic evaluation into an existing yearly database review. Commonly used in usability and human factors engineering, heuristic evaluation is an innovative and dynamic method for librarians to evaluate electronic resources and provide expert feedback to database vendors. A form was developed to streamline the process for the librarians involved. In total, eight librarians evaluated 37 databases as a pilot project. This paper describes the outcome of the pilot.

There are many ways to evaluate an online resource, including subject matter, credibility, the cost, personal value associated with it, and how usable the product is. Usability plays a key role in how users perceive online resources, including databases, and in turn how users perceive their total library experience. How can librarians better record usability errors (i.e., gaps in product effectiveness for users, such as misleading links or confusing options) in vendor products to more formally incorporate usability into their electronic collection assessments? How can these Web usability collection assessments be incorporated into the existing system of electronic resource acquisition and renewal? This paper addresses these questions by describing a pilot project using heuristic evaluations to integrate usability into existing collection assessment.

Heuristic evaluations are an industry standard set of usability parameters to evaluate existing products, usually with a numeric form. Heuristic evaluations are typically conducted by a single expert, which makes them different from usability tests that are conducted with end-users. Unlike usability tests, Heuristic evaluations are quick, often taking less than 15 minutes. They are also low budget, do not require any lab equipment, and have been known to find a high percentage of usability errors in a product (Desurvire, 1994).

Database utility can be determined in various ways, including usage statistics, content analysis and user feedback, but there is no standard process for how librarians assess usability relative to collection decisions. Often libraries know that errors exist, but lack a concrete way of feeding this information to database providers. Because of this lack of feedback, database providers may not understand how usability affects resource selection decisions.

The goal of this study was to investigate the utility of adding heuristic evaluation to the electronic resource evaluation process at Purdue University Libraries, using a newly developed Database Usability Heuristic (DUH) Form. The questions posed in this study were:

1. What new information emerges from adapting user experience methods to acquisition and renewal processes?
2. Does completion of a DUH-Form inform a librarian's opinions regarding database review?
3. Should the DUH-Form be implemented in the future? Is the yearly database review the right time to study database usability, or at another point in the electronic review process, such as acquisition?

To answer these questions, two instruments were designed: the DUH Form and a satisfaction survey about the process of using the form.

Heuristic Reviews

In user experience research, heuristic evaluation is used at early stages in the redesign process. A group of user experience designers develop a heuristic (i.e., a set of usability principles) they can agree on, and then they evaluate a series of web pages. Experts do the testing rather than testing end-users, though, of course, they are experts who have worked with end-users in the past and know their common mistakes. Evaluation includes a deeper dive into the product, testing links, intentionally making mistakes and trying out features. Evaluators record usability errors, finding examples of how the system violates the agreed-on heuristic principles. These reviews are incorporated into reports to stakeholders, often with recommendations for improvement.

The established heuristic evaluation method employed in this study is Nielsen's ten heuristics for user experience design (Molich & Nielsen, 1990, p. 339). Nielsen's heuristic evaluation method evaluates interfaces based on ten principles:

- visibility of system status;
- match between the system and the real world;
- user control and freedom;
- consistency and standards;
- error prevention;
- recognition not recall;
- flexibility and ease of use;
- aesthetic and minimalist design;
- help system to assist users to recognize, diagnose, and recover from errors;
- help and documentation.

Although articles have been written about usability testing of library websites, little has been written on the usability of library databases. Usability testing has been done examining how users access databases but not how they navigate the database interfaces themselves (Wrubel, 2007). Nielsen's heuristics have been applied and adapted for the special requirements of serving diverse populations in public libraries (Aitta, Kaleva, & Kortelainen, 2008). Manzani and Trinidad-Christensen (2006) did a combination heuristic evaluation and usability test of a library school website. Vilar and Zumer (2005) used an adaption of Nielsen's heuristics that focused on functionality and user-friendliness in an expert evaluation of four large-platform databases. Their study focused more holistically on the overall evaluation of the product versus just the usability.

While usability tests are frequently employed in libraries, heuristic evaluations have not been formally used for library collection development practices. Previously the author presented preliminary results from this project (Barnes, 2013). This paper will review the results more fully and present a model for those looking more holistically at their library's total user experience.

Method

Participants and Materials

Located in West Lafayette, Indiana, Purdue University is a public university with an enrollment of 39,256 students (Purdue University Office of Institutional Research, 2013). Each summer, the Purdue University Libraries evaluates a third of its library databases using a process called a database review. Roughly 100 databases are reviewed each year by 20 librarians who each review between one and eight databases, with each database reviewed by one or two librarians, depending on funding for the database. This evaluation covers the databases' intended purpose, usage, audience content, marketing efforts and cost per use, but does not focus on usability of products.

Eight Purdue librarians participated in the pilot study involving heuristic evaluation. All librarians were full-time faculty and had experience with the existing database review process. A new form, the Database Usability Heuristic Form (DUH Form) was developed to enhance the existing review process.

Developing the DUH Form

To create the Database Usability Heuristic Form (see Appendix A), Nielsen's heuristics were integrated into the previously existing Database Review Form (see Appendix B). The existing Database Review Form included questions covering user control and freedom as well as help and documentation (like those of Nielsen's heuristics), so those areas were excluded from the newly created DUH Form so as not to duplicate the efforts already accomplished by the librarians. The remaining eight heuristics (see Table 1 and Appendix A) are incorporated in the DUH Form. For the pilot, librarians filled out both the existing Database Review Form as well as the DUH Form, as was required by the Associate Dean.

Nielsen's heuristics were adapted to Likert questions ranging from 1 (strongly disagree) to 5 (strongly agree) with a "not applicable" option. The DUH Form created for this study contained 18 Likert-scaled questions with a scale of 1 to 6. The process was designed to be time efficient, taking no more than 10 minutes.

Table 1. Eight usability topics used in the DUH-Form.

Visibility of System Status (2 questions)
Match between the System and the Real World (1 question)
Consistency and Standards (2 questions)
Error Prevention (2 questions)
Recognition Not Recall (4 questions)
Flexibility and Ease of Use (2 questions)
Aesthetic and Minimalist Design (1 question)
Help System to Assist Users to Recognize, Diagnose, and Recover from Errors (3 questions)

A short preamble oriented the librarian to the heuristic evaluation process, encouraging consideration of the audience of the particular product. The final DUH Form included instructions, eight sections with one to four questions, and room for comments at the end. Each section of questions covered one of the eight Nielsen's heuristics (see Table 1) to consider.

In addition to the DUH Form and pre-existing database review, a satisfaction questionnaire was designed to determine whether librarians used the information from the DUH Form to inform their database review and if librarians viewed the process positively. The questionnaire consisted of five questions, including additional space for librarian comments. These questions were:

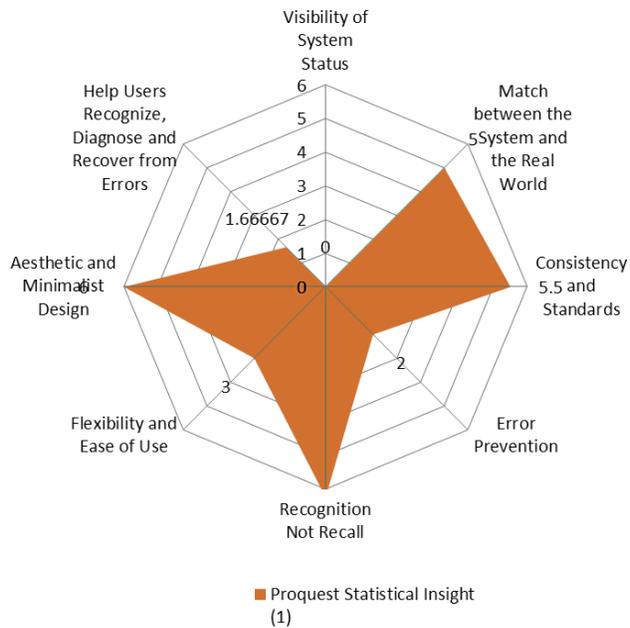
1. What database(s) did you evaluate? Overall, how much impact did the Database Usability Heuristic Review have on your final selection decision?
2. Overall, did you find the Database Usability Heuristic Review redundant with other parts of the database review form? Why or why not?
3. Overall, how much impact did the Database Usability Heuristic Review have on your final selection decision?
4. Overall, did you find the Database Usability Heuristic Review a worthy use of your time? Why or why not?
5. Overall, did you feel that the Database Usability Heuristic Review should be done as part of the database reviews every year? Why or why not?

Results

What new information emerges from adapting user experience methods to acquisition and renewal processes?

Radial graphs provide new information about librarian database evaluations. Figure 1 shows two different DUH Form analyses of the same product by two different reviewers. The two librarians agreed that the database was consistent and aesthetically pleasing but differed on their opinions about its error prevention mechanism and ability to help users recover from errors. Despite these differences, the heuristics evaluation scores were relatively consistent.

Proquest Statistical Insight (1)



Proquest Statistical Insight (2)

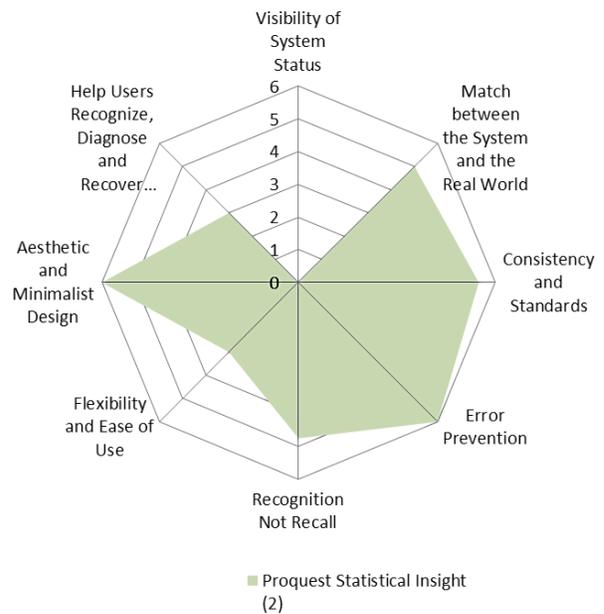


Figure 1. Comparative heuristic evaluations of the same product by different librarians.

Besides comparing evaluations of the same database by different librarians, radial graph results are useful for comparing librarians' evaluations of different databases. For example, Figure 2 demonstrates that different librarians evaluated the USA Trade Online database negatively for flexibility and ease of use while the SRDS Media Solutions database was evaluated positively for flexibility and ease of use. Conversely, USA Trade Online was evaluated positively and the SRDS Media Solutions database negatively for consistency. Therefore, individual evaluations of databases, comparisons of evaluations for the same database, and comparisons of different databases are the new types of information that emerged from this DUH Form process.

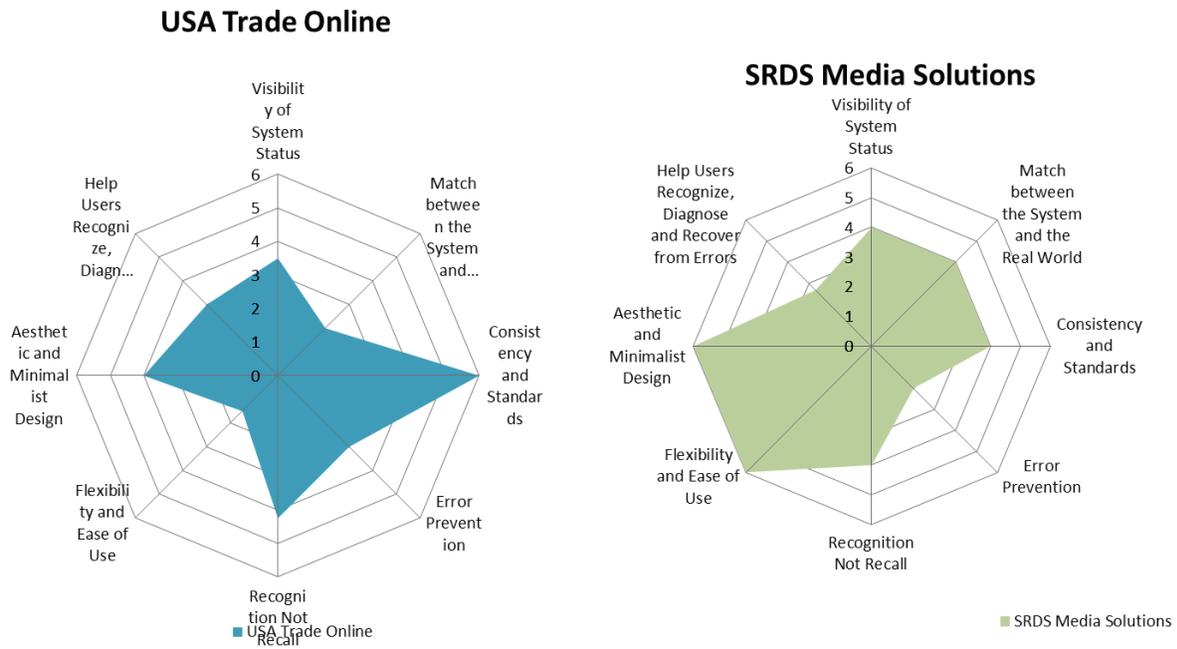


Figure 2. Comparison between different products can reveal strengths and weaknesses of the interface.

Another benefit of having a larger sample of database reviews is that patterns across products are visible, irrespective of their intended audience or design. Figure 3 shows the average score for all database reviews on the eight heuristics; Table 2 shows the values. In general, databases scored highest on consistency and standards, and lowest on flexibility and ease of use.

Average Reviewer Scores

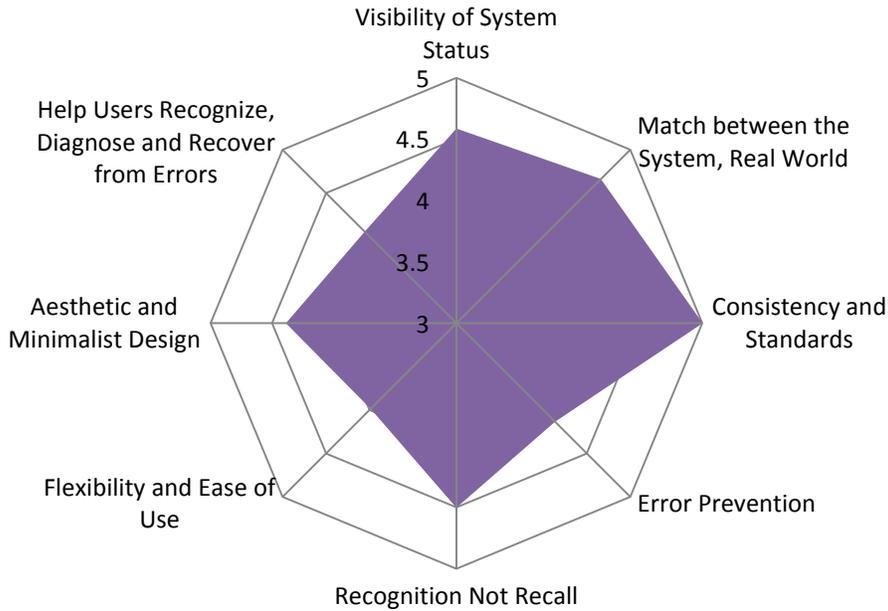


Figure 3. Scale adjusted to highlight differences.

Table 2. The average reviewer score across all databases.

Heuristic	Average Score
Visibility of System Status	4.59
Match between the System, Real World	4.66
Consistency and Standards	5.00
Error Prevention	4.14
Recognition Not Recall	4.50
Flexibility and Ease of Use	3.99
Aesthetic and Minimalist Design	4.39
Help Users Recognize, Diagnose and Recover from Errors	4.05

Another way to use the heuristic evaluations is to sum the sections for each product and provide averages. All 37 products can then be ranked from highest score to lowest (see Table 3).

Table 3. The average score across the eight heuristics.

Rank	Database	Average Score
1	Wildlife & Ecology Studies Worldwide	5.92
2	AFSFA (Combined Aquatic Sciences & Fisheries Abstracts)	5.86
3	CAB Abstracts (now on Web of Knowledge)	5.82
4	GREENR	5.82
5	Annual Reports to Shareholders	5.60
6	Academic Search Premier	5.46
7	OECD iLibrary	5.44
8	Georef	5.36
10	Sociological Abstracts	5.31
11	AGRICOLA	5.26
12	Conference Board Research Collection	5.13
13	Children's Literature Comprehensive Database	5.08
14	Proquest Statistical Insight (2)	4.75
15	Child Development & Adolescent Studies	4.69
16	CINAHL	4.63
17	Environmental Law Reporter	4.54
18	iPOLL Databank	4.50
19	ReferenceUSA	4.35
20	Urban Studies Abstracts	4.33
21	Peace Research Abstracts	4.33
22	Anthropology Plus	4.31
23	AccuNet /AP Multimedia Archive	4.24
24	Proquest Statistical Insight (1)	4.20
25	Tourism Factbook	4.19
26	International Financial Statistics	4.16
27	CEPR	4.09
28	SRDS Media Solutions	4.08
29	Associations Unlimited	4.00
30	FSTA	3.78
31	GPO Index	3.71
32	Tablebase	3.56
33	Forrester	3.42
34	USA Trade Online	3.41
35	Cognet (MIT)	3.33
36	H1 Visajobs	2.94
37	UN Comtrade	2.75

Does completion of a DUH-Form inform a librarian's opinions regarding database review?

Of the eight librarians who completed the survey, seven said that the database heuristic evaluation had no impact on their final decision about whether the library should keep the database. For some, it was a matter of not understanding the process. One librarian commented: "I completed the database review form prior to the heuristic evaluation so felt that I had sufficient information to make a decision". Others did not find the process useful for the review process since they believed that "[u]sability is seldom a

determining factor. Librarians might complain to the vendor or ask for changes for usability but unless a database is completely unusable, I don't think it would affect retention." Similarly, others pointed to areas that had more effect on their database reviews, as one evaluator stated, "The deciding factor is the importance of the content. The interface has zero influence on the decision to keep these databases."

Librarians indicated that the completion of the DUH Form did not inform their database reviews. However, of the two databases discontinued following the summer reviews, the poor usability of one of those databases was a contributing factor in the decision to discontinue. Therefore, overall, in response to research question 2, librarians did not perceive that the DUH Form informed their evaluation process, yet there is some evidence that the analysis of usability through the process contributed to at least one decision to discontinue a database.

Should the DUH Form be implemented in the future? Is the yearly resource evaluation the right time to study database usability, or at another point in the electronic review process, such as acquisition ?

In response to the question "Should the DUH Form be implemented in the future?" six of eight librarians said no. One librarian commented: "It would be useful in the case of a database that is really difficult to use or inappropriate for the intended audience". Another looked to the acquisition period as a better time to evaluate a product's usability: "A heuristic evaluation is likely to be more helpful when there is a new interface. Otherwise we've all long since learned to overlook, or adapt to any quirks of a given database interface." The comments indicated that perhaps the DUH Form process would be useful in specific cases such as databases with poor usability or at the time of database acquisitions.

Discussion

Graphical representation of the evaluations can be useful for comparing two databases that have similar uses or to compare various evaluations of the same database. The questionnaire results indicated that this type of DUH Form evaluation might best be used for databases that have obvious poor usability or when libraries are considering a new acquisition. DUH Form evaluations could also have a long-term effect, since librarians could refer to the prior evaluations that have been scanned and put on a collaborative drive for all to view.

The questionnaire results also indicated that while librarians are concerned about their own and/or patrons' needs, they are less concerned with the relationship between libraries and vendors. No comments addressed the possible utility of this process for working with vendors. However, the DUH Form evaluation results are one way in which usability data provided by expert users (librarians) could be collected and shared with vendors. These graphs offer opportunity to compare different products with similar purposes. The ranking of any product by usability could be a useful tool for evaluation and communication with a vendor.

An interesting question emerged from this work: how would an ideal library database score on this survey? Would it score high in all of these areas? If a library database only needs to have good comparative usability to other similar products, something like Table 2 could prove to be very useful to librarians looking to select a product of higher usability. The satisfaction surveys reveal that there are some products where usability is not a factor in the librarians' decision-making, but the reviews themselves do show a large amount of variation in the strengths and weaknesses of products.

Content still is the most important factor in database acquisition. Though the usability does not impact whether a library keeps a database, it could be a factor in other ways, such as what additional modules the library buys or whether the product is cancelled when another product becomes available. Additionally, usability may affect usage, leading to user error to the point that the database is unusable for non-expert users.

Limitations

Communication is key to the success of a project like the DUH Form evaluation. Many of the librarians did not have backgrounds in user experience research. Lack of communication led to a lower number of DUH Form evaluations by librarians than expected; only eight librarians from the full library faculty filled out the form. To implement this type of evaluation form, others should consider meeting with librarians in advance to explain user experience research, the potential benefits of the additional evaluation, and how to complete the evaluations. An additional suggestion would be to assign due dates periodically to help libraries accomplish their goals in stages, or to have librarians complete the heuristic evaluations as a batch before the library performs database reviews.

In the interest of making the form accessible, two points of the ten point heuristic evaluation were not included because they appeared on the Database Review Form. A process like this may benefit from deeper dive into the heuristic reports with fewer participants. Heuristic evaluations might also work better as a tool rather than as a requirement. The small sample size of the pilot (eight librarians) was also a limitation of the study.

Conclusion

This heuristic evaluation project offers valuable insights into how one can more effectively record usability errors in vendor products. These insights can also be formally incorporated into collection assessment. The DUH Form evaluation offered a quick, potentially useful tool to articulate usability issues with a database product. This process has great possibility for use of large library consortia to argue for large-scale interface redesign. This study has found that while the heuristic evaluations for database usability can be useful, perhaps they do not belong in the yearly database review process. Heuristic evaluations can be useful in new database acquisition, database renewals, and borderline cases where usability might play a larger role.

However, in order for heuristic evaluations to be successful, they need to be incorporated into existing processes. The low satisfaction reported by the librarians included in this study suggests two things. First, perhaps usability is not currently a determining factor for librarians, but rather a second tier evaluation criterion, ranking below the content and usage. Second, the current tool may need better framing and design in order to be effective for librarians, or perhaps should be used in other processes, such as database acquisition or borderline cases.

As libraries incorporate user experience more deeply into their website design and space assessments, it is important that they also consider how the design of vendor products affects the library user experience. Inadequate interface design of vendor products could affect overall library perception by library users. Processes like the heuristic evaluation can be used to start a conversation between vendors and librarians that can lead to an overall better user experience.

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APPENDIX A

Database Usability Heuristic evaluation

Database being reviewed: _____

Purpose of Research

The objective of this study is to examine the impact of incorporating user experience study methods into library database purchase and renewal. It focuses on introducing a relatively standard usability concept (heuristic evaluation) into an existing yearly electronic resource evaluation process at Purdue. This study involves introducing more user experience parameters into process. This project could contribute to our internal process for database renewal and selection in the future at the libraries. Please fill out this form to the best of your ability.

Directions:

1. Review the information goals you have provided on the data resource. What is the expected user? Faculty from a specific department? Students? Staff?
2. Try a simple search in the product. As you go, write down any issues you find and their severity.
3. Observe the navigation of the site. Try a couple of links to observe consistency and path. As you go, write down any issues you find and their severity.
4. Try something incorrect in the database, such as group of keywords that have no effect or a link that is not on our access area. What happens? Does it prevent your errors? As you go, write down any issues you find and their severity.
5. Observe if there is help or documentation provided. As you go, write down any issues you find and their severity.
6. Observe if the system is easy to learn for your expected users. As you go, write down any issues you find and their severity.
7. Observe: Is the system easy to use? Is the design aesthetically pleasing and clear? As you go, write down any issues you find and their severity.
8. Fill out the questionnaire on the page by putting x in the square the match your feelings about the systems. As you go, write down any issues you find and their severity.
9. Comment on the average usability of the product as you have surmised from doing the evaluation.

10. After you have finished your database review, please fill out this survey your experience: (INSERT URL HERE)

N/A Strongly Disagree Strongly Agree

Example.

		X				
N/A	1	2	3	4	5	6

1. Visibility of System Status

The database keeps the user informed through constructive, appropriate and timely feedback.

N/A	1	2	3	4	5	6

The database responds to the user-initiated actions. There are no surprised actions by the site or tedious data entry sequences.

N/A	1	2	3	4	5	6

2. Match Between the System and the Real World

Language usage in terms of phrases, symbols and concepts is similar to that of users in their day-to-day environment.

N/A	1	2	3	4	5	6

4. Consistency and Standards

The same concepts, word, symbols, situations or actions refer to the same thing.

N/A	1	2	3	4	5	6

Common platform standards are followed.

--	--	--	--	--	--	--

N/A	1	2	3	4	5	6
-----	---	---	---	---	---	---

5. Error Prevention

The database is designed in such a way that the users cannot easily make serious errors.

N/A	1	2	3	4	5	6

When a user makes an error, the database gives the appropriate message.

N/A	1	2	3	4	5	6

6. Recognition Rather than Recall

Objects to be manipulated, options for selection, and actions to be taken are visible.

N/A	1	2	3	4	5	6

The user does not need to recall information from one part of a dialogue to another.

N/A	1	2	3	4	5	6

Instructions on how to use the system are visible or easily retrievable whenever appropriate.

N/A	1	2	3	4	5	6

Displays are simple and multiple page displays are minimized.

N/A	1	2	3	4	5	6

7. Flexibility and Ease of Use

The database caters for different levels of users, from novice to expert

N/A	1	2	3	4	5	6

Shortcuts or accelerators, unseen by novice users, are provided to speed up interaction and task completion by frequent users.

N/A	1	2	3	4	5	6

8. Aesthetic and Minimalist Design

Site dialogues do not contain irrelevant or rarely needed information, which could distract users.

N/A	1	2	3	4	5	6

9. Help Users Recognize, Diagnose, and Recover from Errors

Error messages are expressed in plain language.

N/A	1	2	3	4	5	6

Error messages define problems precisely and give quick, simple, constructive, specific instructions for recovery.

N/A	1	2	3	4	5	6

If a typed command results in an error, users need not retype the entire command, but only the faulty part.

N/A	1	2	3	4	5	6

Comments on usability of product:

Appendix B
Database Review Form 2013
(Created by Purdue University Libraries Information Resources Council)

Purdue University Libraries
Evaluation of Electronic Resource
2013

Resource name _____
Date acquired _____
Provider/vendor _____
URL _____
Date of last review _____

Recommendation:

- A. Continue access*
- B. Recommend different provider*
- C. Replace with another similar resource*
- D. Cancel access*

1. Information

2. Quality of the resource

3. Available Instruction / Help

4. Usage / Cost

5. Additional comments

Submitted by: _____ Date: _____

and

_____ Date: _____

Recommendation from Libraries Resource Review Committee: Date: _____

- A. *Continue access*
- B. *Recommend different provider*
- C. *Replace with another similar resource*
- D. *Cancel access*

Decision of Libraries Associate Dean for Academic Affairs:

- E. *Continue access*
- F. *Recommend different provider*
- G. *Replace with another similar resource*
- H. *Cancel access*

_____ Date: _____

ADAA

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