

Enabling Data Discovery and Data Re-use by Improving Software Usability

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This research into, and experience with, data product design offers an augmented definition – one that elevates relationships and engagement with the final user of a product. Essentially, no matter how fantastic or technically advanced a product appears, the intended audience of that product must be able to understand, use, and find value in the product in order for it to be considered a success. Usability is often misunderstood and seen as common sense or common knowledge, but it is actually an important and challenging piece of product development.

This paper describes the National Snow and Ice Data Center’s process to usability test the Arctic Data Explorer (ADE). The ADE is a federated data search tool for interdisciplinary Arctic science data that has been improved in features, appearance, functionality, and quality through a series of strategic and targeted usability testing and assessments. Based on the results, it is recommended that usability testing be incorporated into the skill set of each data science team.



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ABSTRACT

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National Science Foundation
ACADIS
Arctic and Coastal Data Integration Service

Purpose of Usability Testing

The Arctic Data Explorer (nsidc.org/acadis/search) is a federated data search tool with over 20,000 dataset records from over 10 repositories. Usability testing throughout our software project ensures that the **needs and wants of the intended audience are met**. Subsequent resources and focus evolve based on feedback gleaned by talking directly with and observing actual users.

Card Sorting

Research Topic	Methods and tools	Audience	Results
Planning process	Card Sorting	Early project	Aligned Keyword
Next steps	Online survey using Quickfire	Advisory committee	Spatial and Temporal as most important features
New features	Quickfire and ranking session	MSD project - Early career scientists	People want to be able to scan the page with a map.

A/B Testing

Research Topic	Methods and tools	Audience	Results
Learning Page	A/B testing	General audience	Matched preferences, but the insights
Do people understand what the tool is for?	Online survey using Amazon's Mechanical Turk	wiki-savvy people	informed decisions in our final design.
Do they like the way it looks?	mturk.com	\$30 budget	

In-Person Interviews

Research Topic	Methods and tools	Audience	Results
Quality of search results	In-person interviews	Scientists	Improved relevance ranking algorithm
Tool functionality	Task-based and semi-structured interviews	Engineers	Facet binning
Aesthetics	Interviews	Graduate Students	Map interaction
Confidence in the tool	"Think Aloud" method	NSIDC User Support	Map display
Trust	Multiple role-takers	Experts	Temporal interaction
Error handling	Task-based and semi-structured interviews	Technical Writers	Sorting
Facet search	Some were like focus groups	ACADIS Advisory Committee	Pagination

Online Interviews

Research Topic	Methods and tools	Audience	Results
Accessibility (General look and feel)	Online, one-on-one interviews	Early career and seasoned scientists	Discovered a number of bugs to fix.
Quality of search results	Task-based and semi-structured interviews	Librarians	Tool usability compared to traditional data discovery.
Facet/tool functionality	"Think Aloud" method	Engineers	GIS experts
Visual analysis	Video analysis	GIS experts	Scan-ability of results.

Heuristic Evaluation

Research Topic	Methods and tools	Audience	Results
Tool Functionality	Heuristic evaluation	Ph.D. students	Improve error messages.
General audience communication	Complete product to be accepted by standard principles	University of Colorado Boulder	Documents like FAQs need to be easier to find.
Accessibility (ADA compliance)	Checklist and suggested actions	Data Curator	Add "alt" info to images. Keyboard selection.

Recommendations

- A big budget is not necessary.
- PLAN! Research questions, methods, and audiences need to match and be focused
- Testing should happen often and throughout the project.
- Prototype! Start testing even before coding.
- Communicate that you are testing the product, not the user.
- Have multiple people take notes. Each will contribute unique and informative observations.
- Be very careful how you ask questions and present tasks so that you don't influence the results.

Conclusions

- Tools that work get used again.
- To ensure products are useful and easily understood, testing is necessary.
- The intended audience MUST be solicited for feedback
- Testing can take many forms and many of them are free or cheap.
- User-Centered Design (UCD) is NOT “common sense”, but it is not difficult to incorporate into a project.

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Figure 1. Sample of Heuristic Evaluation Output