Guide to Usability and Analysis Techniques
For the Office of Energy Efficiency and Renewable Energy (EERE)

Creating effective websites that answer our customers' questions and help them take action is the heart of good customer service. This practical "how to" guide to the common tools and techniques will help you learn what your customers need and how to design sites and applications your customers will love.

Table of Contents

Defining Measurable Goals

Before you develop or redesign a website or application, you'll want to think about how you will measure the success of your product. One way to do this is by defining measurable goals for your Web product up front.

What Are Measurable Goals?

Measurable goals are those that allow you to:

- Specify targets for success to help guide the development process
- Benchmark the success of the product you develop and set targets for future improvements
- Quantify the effect of improvements you make over time.

Along with customer information needs and preferences, your product goals should drive design and content decisions.

When to Establish Your Goals

You should establish measurable goals for your product at the time you write your project charter. Your goals should be reviewed and updated every year.

How to Establish Measurable Goals

Start by determining the goals you want to achieve. You may choose to include different types of goals depending on what you are trying to accomplish. Here are some types of goals to consider:

- **Office and Communication Goals**
  Business goals for your site or application should come directly from your office's mission as well as the overall mission and goals of EERE. You may also want to specify goals around how the product you are developing will improve communication between your office and your target audiences.

- **Usability Goals**
  You can set usability goals for the product as a whole and/or for particular customer tasks. Typical usability goals might include:
    - Customers can find what they need within X minutes and with 2 or less attempts
    - Customers can understand what they find and take action
    - Customers are able to learn their way around quickly
    - Customers perceive our site as easy to use.

- **Satisfaction and Perception Goals**
  Examples of satisfaction and perception goals include:
    - Be perceived as the main federal source for up-to-date, unbiased, and reliable information on X
    - Customers are satisfied with their experience on the website and actively promote the site to others.

Measuring Your Goals

Once you set your goals, you will need to define specifically what success means for you and how you will measure each goal.

For example, if one of your usability goals is that your customers can successfully find what they need, success might mean decreasing the number of non-technical calls you receive by 50% and that your customers can find what they need within 1 minute and 2 or less attempts 80% of the time.

You can measure this by tracking the number of calls to program staff and through task completion metrics (such as success rates and time on task) during usability tests.

EERE's Web Usability Coordinator can provide mentoring and additional guidance on establishing measurable goals.

Surveys

Surveys can be a useful way to learn more about your customers and their satisfaction with your Web products. Here you can learn how to develop, get approval for, and build an effective survey.

Pros and Cons of Surveys
Advantages
While there are many techniques available to help us learn about our customers, surveys are a great choice when you:

- Want feedback from a wide range of customers
- Need a technique that is relatively time- and cost-efficient
- Want to automate the data collection process.

Surveys can help you answer questions such as:

- Who is using our product or service?
- What are they trying to accomplish with our product or service?
- How satisfied are they with our product or service?
- How can we improve our product or service?

Limitations
However, surveys also have the following limitations:

- Reliability is less certain. We can't control who responds to our surveys, so the reliability of the data can be more difficult to establish than with other methods.
- Answers rely on memory. What people remember isn't always completely accurate.
- There are no opportunities for follow up. Surveys don't allow you to probe or follow up on the answers people give.
- It's hard to learn about specific usability issues. What users *say they do* and what they *actually do* are often very different.

To account for the limitations of surveys, we often pair them with other methods of collecting feedback such as interviews, focus groups, and usability tests in order to get a complete picture of our customers, their behavior, and their motivations for using our site.

Developing an Effective Survey
Planning Your Survey
When you start planning your survey, there are several questions you'll want to consider:

- **What is the purpose of my survey?** Understanding what you hope to get out of your survey will help you choose the right questions.
- **How long does it need to be?** The length of your survey will depend on your audience, the subject, your purpose, and the nature of your questions. As a rule of thumb, we recommend limiting your survey to 15 questions or less to improve completion rates.
- **When should I run it?** Avoid low traffic times, or times you know are very busy for your audience. If there are seasonal events that affect your Web traffic, you may want to take that into account when scheduling your survey.
- **How long should I run it?** Decide how many participants you need to have in order to feel confident in the survey results, and then run it until you hit the quota you want. Typically, we run our qualitative surveys until the answer percentages for key questions begin to stabilize (often three to six weeks).

- **How will I advertise it?** It's important to ensure that the right people are filling out your survey—so choose your recruiting methods appropriately. Often, we advertise our surveys via our website and/or through appropriate listservs. Be sure to consider how ways you advertise your survey could bias your survey results.
- **What approvals do I need to plan for?** You'll need approval from the Web Governance Team and the Office of Management and Budget (OMB). Learn more about getting the necessary approvals.

Writing Your Survey
Here are some things to consider when writing your survey:

- Ask simple questions using clear language.
- Ask your most important questions first.
- Ask for only the data you really need and will use.
- Ask questions in a format that you can analyze. Open-ended questions can be valuable for explanations and learning the vocabulary of the users, but are hard to analyze; limit the number of open-ended questions to only those you really need.
- Break your survey into multiple pages. That way, if participants leave the survey early, data for pages they complete will be saved.

A note about Personally Identifiable Information (PII): If you collect any information about a person, such as their name, phone number, or address, then your project is handling PII. Be sure you are clear on the rules for collecting and storing PII before you begin your project.

More Information

- Bureau of Labor Statistics: Steps to Design a Better Survey – Best practices for crafting survey questions

EERE's Web Usability Coordinator can provide further examples, mentoring, and additional guidance on designing your survey and analyzing the results.
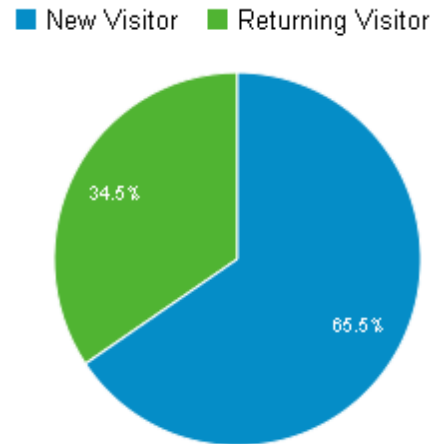
Statistics & Search Log Analysis

EERE uses Google Analytics to gather statistics on our customer's behavior, tools, and tasks when interacting with our sites. Here you'll learn what this type of analysis can tell you and how to set up and access your statistics and search logs.

Pros and Cons of Statistics and Search Log Analysis

Advantages of Statistics Analysis

Your site's statistics can be invaluable in helping you understand how your customers interact with your site. Specifically, they can provide insight about:

- How popular your site is (number of visitors)
- Who your customers are and what tools they use
    - Where they live
    - What language they speak
    - What browsers and operating systems they use
    - What mobile devices they use
    - Social media tools they use
- How they find your site
    - Search engines they use
- How customers interact with your site
    - How often they come to your site
    - How long they stay
    - Typical paths they take through the site
    - Popular content (often reflects customer top tasks)
- What people are looking for (terms and phrases they type into search engines)
- Problems customers may be encountering when interacting with your site
    - Pages with high bounce rates (percentage of people who enter a page and leave without clicking)
    - Pages that load too slowly.

Advantages of Search Log Analysis

Your site's search logs, which are a record of key words and phrases that people have typed into your site's search box, are a great way to learn what your customers are looking for when they come to your site. They can help you understand:

- What pages people search from
- Your customer's top tasks (what customers want and why they are at your site)
- The language your customers use (does it match the language of the site?)
- The ways in which customers seek information (by topic? Audience? Geographically?)
- The usefulness of your search results (do the search terms people use bring them to the page that best answers their query?).

Note: Your site's search logs are different from the "organic search" report under Traffic Sources. The organic search reports on search terms people typed into external search engines like Yahoo in order to find your site. Your site's search logs are a record of searches customers have done while on your site, using your site's search feature. Both types of reports are valuable in different ways.

Limitations

Statistical and search log analysis helps you understand *what* people do on your site – but it does not tell you *why* people do it. For example, say you have a page with a high bounce rate. This could indicate that the page doesn't include information people expect to find there, and so they leave. Or it could mean people found the page, got exactly what they needed, and left.

To help answer the "why" questions, we often pair this type of analysis with other methods of collecting feedback such as usability tests in order to get a complete picture of our customers, their behavior, and the problems they experience when interacting with our site.

More Information

- Internal Site Search Analysis – Five ways to analyze your site's search log data (article from A List Apart)

EERE's Web Usability Coordinator can provide further examples, mentoring, and additional guidance on analyzing your statistics and search logs.

Interviews & Focus Groups

Interviews and focus groups can provide in-depth insights into customer motivations and preferences. Here you will learn what interviews and focus groups are, how to conduct effective sessions, and how to get approval for your project.

What Are Interviews and Focus Groups?

In interviews and focus groups, you talk directly with your customers or stakeholders, either in person or by phone. Interviews are typically done with one person at a time, while focus groups are moderated discussions that are conducted with a small group of 5-10 people, generally in person.

Pros and Cons of Interviews and Focus Groups

Advantages

Interviews and focus groups are useful when you want to:

- Probe deeply to understand customer attitudes, opinions, and motivations
- Understand your stakeholder's needs and requirements
- Learn about issues that are complicated or difficult to articulate concisely
- Test assumptions and responses to current or future offerings
- Gather information about sensitive topics.

These methods are particularly effective as a follow up to quantitative methods such as surveys because they help you understand *why* customers hold a particular opinion or prefer one product over another.

Choose interviews when you:

- Want the freedom to discuss a topic in detail with an individual
- Don't want your participants' comments to be influenced by group dynamics
- Feel it's important to adjust your interviewing style to a participant's specific needs.

Choose focus groups when you:

- Want to brainstorm and generate ideas
- Get feedback on a product or new design
- Want to encourage interaction and the generation of new ideas based on that interaction.

Limitations

You should be aware that interviews and focus groups have the following limitations:

- You interact with a limited number of people.
- Collecting the data can be time consuming.
- It's hard to learn about user behavior. What users *say they do* and what they *actually do* are often very different.
- Focus group participants can influence one another.

To help address some of the limitations, we often pair interviews and focus groups with other methods of collecting feedback such as surveys, statistical analysis, and usability tests in order to get a complete picture of our customers, their behavior, and the problems the experience when interacting with our site.

Conducting an Effective Interview or Focus Group

Planning Your Sessions

When you start planning your interview or focus group sessions, there are several questions you'll want to consider:

- **What is the purpose of these sessions?** Understanding what you hope to get out of your sessions will help you choose the right questions.
- **How will I choose participants?** It's important to ensure that you are talking to the right people – so choose your recruiting methods appropriately.
- **Who will moderate the sessions?** Effective moderators know how to make participants feel comfortable, ask questions in an unbiased way, are good listeners, and know when to ask for more details.
- **How will I capture the data?** It's difficult to moderate and take notes at the same time. Consider bringing in a separate note taker and/or taping the sessions. Be sure to record your participants' permission for taping the session.
- **What approvals do I need to plan for?** You'll need approval from the Web Governance Team and possibly the Office of Management and Budget (learn more about the approval process below).

Developing Your Session Materials
Here are some things to consider when designing the materials you'll use in your sessions:

- Develop a script that:
    - Explains the purpose of the session
    - Sets expectations/ground rules
    - Articulates questions and follow up probes
    - Describes confidentiality of responses.
- Ask simple, unbiased, open-ended questions using clear language.
- Ask for only the data you really need and will use.

A note about Personally Identifiable Information (PII): If you collect any information about a person, such as their name, phone number, or address, then your project is handling PII. Be sure you are clear on the rules for collecting and storing PII before you begin your project.

Pilot Testing Your Materials
Be sure to pilot test your script and questions with a few people who know your audience before you conduct your sessions. Ask your testers to let you know:

- If there were any questions they found confusing or ambiguous
- If any of the questions were asked in a biased way
- Their impressions of the question flow.

Getting Approval for Your Interviews and Focus Groups
All interviews or focus groups that involve EERE's customers need approval from the Web Governance Team (WGT), and some will need OMB approval as well.

Step 1: Web Governance Team
All session materials should be submitted to the Web Governance Team (WGT) for approval. Schedule a meeting with WGT once your materials are complete.

Step 2: Office of Management and Budget
OMB approval is necessary when you are working with 10 or more members of the general public. OMB approval is not required if surveys are conducted internally among federal staff. Government contractors are *not* considered federal staff members.

Submit your session materials to OMB after you have received WGT approval.

More Information

- [Ux Matters: Dos and Don'ts for Focus Groups](#)
- [Ux Matters: Preparing for User Research Interviews: 7 Things to Remember](#)
- [Ux Matters: Developing Your Interviewing Skills, Part I: Preparing for an Interview](#)
- [Ux Matters: Developing Your Interview Skills, Part II: During the Interview](#)

EERE's Web Usability Coordinator can provide further examples, mentoring, and additional guidance on developing your materials and conducting your sessions.

Click Analysis Using Crazy Egg

Analyzing where our customers click on our Web pages can be a valuable way to better understand how people interact with our content. Here you will learn more about what click analysis is, how to plan an effective click test, and how to analyze your results.

What Is Click Analysis?

Click analysis helps us track and visualize customer usage patterns on our sites. At EERE, we use a tool called Crazy Egg, which collects information on where customers click when they come to a particular page, and creates heat maps and other reports of usage patterns.

Pros and Cons of Click Analysis

Advantages

Crazy Egg usage reports show us where people click when they visit our Web pages, and can help answer questions such as:

- What items on this page are most popular? (Could provide clues to user top tasks)
- What percentage of our customers return to this page?
- Do people search from this page?
- Do they interact with the top navigation and how?
- Do people scroll down to the bottom of the page?
- Do they interact with the image rotator?
- Do people click on any unlinked graphics?

Limitations

However, click analysis has the following limitations:

- **Tells you *what* but not *why*.** Click tests help you see where users click, but it won't help you understand why customers interact with your site in a particular way.
- **Not site wide.** Crazy Egg tests are set up on individual pages (generally 3-5 and a time), so you must choose the pages you want to test carefully and realize you aren't seeing the full picture.
- **Dynamic pages can be hard to interpret.** Crazy Egg takes a screenshot of your page and tracks clicks against it. If you have a dynamic feature such as an image rotator on your page, you will see where on the page people click, but you won't be able to see exactly which images they are clicking on.

To account for the limitations of click analysis, we often pair it with other methods of collecting feedback such as usability tests in order to get a complete picture of our customers, their behavior, and their motivations for using our site.

Conducting an Effective Click Analysis Using Crazy Egg

Planning Your Test

When you start planning your click analysis, there are several questions you'll want to consider:

- **What are my research questions?** Start by developing a list of research questions that you'd like to investigate. This will help you choose the right pages to test.
- **What pages will I test?** Your research questions will ultimately determine which pages you test—but as a rule of thumb, consider testing:
  - The home page

- o Pages you plan to update in the near future (allows you to compare usage before and after the update)
- o Pages with unique templates (second level pages that use the right column, for example)
- o Popular pages or top entry pages
- o Pages with content your program wants to highlight
- o Pages that might be affected by special media coverage.
- **How many pages should I test?** Select about 3-5 pages for each test.

Analyzing Your Results

When your test finishes running, you can start the data analysis. Crazy Egg provides several different ways to look at your usage patterns, including a heat map view, a list of click data, and the ability to filter the results by referrer, time to click, etc. Note that the warmer colors indicate more clicks, and the cooler colors indicate less clicks.

The data you see can help you make immediate, data-driven design changes based on your research questions. It may also raise additional questions that you can explore using other usability methods, such as interviews or usability tests.

EERE's Web Usability Coordinator can provide further examples, mentoring, and additional guidance on click analysis and interpreting your Crazy Egg results.

Customer Profiles & Personas

Once you have done your user research, it's time to put your findings together to create a complete picture of who your customers are and their goals, motivations, and limitations. Here you will learn how to develop effective customer profiles and personas.

What Are Customer Profiles and Personas?

Customer profiles and personas are a synthesis of your research about your target audiences, and are designed to help your team make customer-driven decisions about your website. Each profile or persona represents a unique group of customers who have similar goals or characteristics. Successful profiles and personas are *data driven*—meaning, the information you use to create them comes from user research activities such as surveys, interviews, statistical analyses, and click analytics.

Customer Profiles

Customer profiles are comprehensive summaries of your research data. They describe the full range of characteristics about each of your customer groups, including their personal characteristics, relationship with the organization, experience and knowledge, work environment, content needs, motivations, expectations, and specific tasks.

Personas

Some design teams use their customer profiles to develop personas. A persona is a fictional person who represents each of your major customer groupings. Personas often include a name and a photo as well as a narrative about the individual's circumstances, which illustrates his or her specific needs, limitations, and motivations.

Personas can be a useful communication tool because they help bring your customers to life for your stakeholders and design team.

Pros and Cons of Customer Profiles and Personas

Advantages

Profiles and personas can be successfully used to:

- Help stakeholders and the design team determine what the site should do and how it should behave. For example, they help you answer questions such as, "which of these features will best help Robert find out where he can get a free energy audit?"
- Identify gaps in your user research (to be filled in with additional research in the future).
- Establish recruiting criteria for future usability work. This ensures that you are talking to the right people.
- Understand your customers' top tasks and the relevant content or design implications those tasks may have.

Limitations

Some stakeholders reject personas because they don't understand to role personas can play in helping the team make decisions about design choices, or because they feel they are not comprehensive enough. You can circumvent this limitation by:

- Carefully choosing the deliverable (profiles or personas) that will work best for your stakeholders and team
- Thoroughly explaining the purpose and benefits that personas can bring when used as archetypal design targets.

Developing Effective Profiles and Personas

Here are some tips for developing effective profiles and personas:

- **Start with the EERE-wide silhouette personas.** These six personas resulted from an extensive, EERE-wide user research project completed in 2011; customer groupings were created based on unique audience motivations. These personas can be used as the starting point for your own, topic-specific personas. Refine them for your topical area by adding topic-specific goals and tasks, and by filling in gaps using your own user research. Note that your office may work with some but not all of these customer groups—focus on the ones important to your office.
- **Triangulate your findings.** Use as many different data sources as you can when developing your profiles or personas. You will start to see particular themes emerge as you analyze your data. Seeing the same finding emerge from different sources gives you confidence in the validity of your findings and helps mitigate the biases inherent in all data sources.
- **Keep track of your data sources.** During analysis, document the data source from which each finding comes—that way, you can go back to the source if you have questions about the finding in the future.
- **If you have gaps, note them and keep moving.** If you have gaps in the data, note them as "to be researched in the future" or fill in your assumptions in italics (for example) as a placeholder. Knowing what we don't know helps us target additional work in the future.

See the resources under the More Information section below for detailed guidance on developing effective personas.

More Information

- [Ux Matters: User Research for Personas and Other Audience Models](#) - Methods for researching your audience, creating personas, and communicating your research
- [Usability.gov: Personas](#) – Benefits, best practices, and a sample persona
- [Measuring Usability: 7 Core Ideas about Personas and The User Experience](#)

EERE's Web Usability Coordinator can provide further examples, mentoring, and additional guidance on developing customer profiles and personas.

Scenarios

Scenarios are one of the most important ingredients in many different usability activities. Here you will learn what scenarios are and how to write effective scenarios.

What Are Scenarios?

A scenario is a very short story that provides contextual details about a task you would like a study participant or site reviewer to try to accomplish by using your site or application.

Scenarios are based on customer tasks from your user research, research questions, and business goals. They provide realistic details, requirements, and constraints that help put participants and reviewers into the right context when interacting with your site during a testing session.

You will likely need to create scenarios for usability reviews, usability tests, and tree (architecture) tests.

Writing Effective Scenarios

Effective scenarios:

- **Are realistic.** They should be based on tasks you know from your user research that actual customers want to accomplish when visiting your site.
- **Are written in your customers' language.** Scenarios should be written in plain language, using a conversational style, and should not include jargon or acronyms. Use words that you know your customers actually use (search logs and open-ended survey questions are very helpful in learning the language of your customers).
- **Are short.** They need to include enough information to put your participant into the correct context, but not so complex that your participant gets lost in the details. Shoot for one to three sentences per scenario. (Longer than three sentences is OK for in-person usability tests; remote or unmoderated test scenarios should be on the shorter side.)
- **Help address your research questions.** Scenarios result from the careful triangulation of your user tasks, business goals, and research questions. When choosing scenarios to present to your participants, you'll want to choose a set that will help you uncover specific usability concerns you and your team might have.
- **Have a clear end point.** Scenarios should be written with a clear Web page or piece of information as the answer—that way, you can effectively score whether your participant was successful in completing the scenario or not.

When drafting scenarios, you should AVOID:

- **Using the language of the interface.** Don't use overly technical language, or words used on your website or in the architecture you are testing—they tend to be magnets, and could give you falsely positive usability scores.
  - *Bad wording:* "You want to find solar information resources."
  - *Good wording:* "You are interested in finding out about the market for solar technologies in 2014."
- **Giving instructions.** Don't tell people what to do or where to go on the site to find the answer to the scenario.
  - *Bad wording:* "Type your search term into the box on the upper left."
  - *Good wording:* "Where else could you find information about wind farms?"
- **Asking users to explore and evaluate the site.** Avoid asking people to browse around the site and give generalized feedback.
  - *Bad wording:* "Look at the About section and give me your feedback."
  - *Good wording:* "What are the most important things on the home page? Why?"
- **Taking participants out of context.** Scenarios that are too directive can take the person out of a goal-oriented experience.
  - *Bad wording:* "Register for the email list."

- o *Good wording:* "You want to know when there are updates to the site. Find a way to be notified when things change."

Sample EERE Scenarios

Below are some sample EERE scenarios that came from common customer tasks uncovered during the 2011 EERE-wide user research study. You can use them as examples or modify those that are relevant for your own studies:

- **Contact information**
  You want to email someone for information regarding hydrogen storage. Find an email address for someone you could correspond with.

- **Financial incentives**
  You are interested in grants for energy efficiency and renewable energy research and development. Find out what grants are currently available.

- **About EERE**
  You want to learn more about the Office of Energy Efficiency and Renewable Energy. Find out what initiatives the Office is currently working on.

- **Event**
  You recently read a news story about an event in Washington D.C. where students compete to build the best solar-powered houses. Find out when the Department of Energy will be hosting the next solar-powered house event.

- **Resource maps**
  You are researching the best places for wind turbine farms. Find out which U.S. state or region would make a good location for a wind farm.

- **Email updates**
  You want to stay in touch with the latest developments in energy efficiency and renewable energy technologies. Find out where to sign up for email updates.

- **Energy basics**
  You are interested in learning more about hybrid cars that are powered by electric motors and fuel. Find an explanation of how hybrids work.

- **Funding opportunities for inventors**
  You are interested in developing renewable energy technologies and want to know if you can get funding for your project. Find out what types of funding the Office of Energy Efficiency and Renewable Energy offers to those who develop clean energy technologies.

- **Software tools**
  Your town is building a new City Hall, and you've been asked ensure the building is energy efficient. Find a tool that can help you model the new building's use of energy and water.

- **Emerging technologies**
  You want to learn about the latest technologies in energy efficiency and renewable energy. Find a list of emerging technologies that the Department of Energy labs and their partners are working on.

- **Case studies**

You've been asked to look for ways to cut electrical costs for lighting in the parking garage at the Department of Labor. You want to find out how others may have solved this problem. Find an example of how another group has implemented a street lighting project.

- **EERE initiatives and programs**
  You've been asked to upgrade a shopping mall to reduce its energy use. Find out if the Department of Energy offers a program that can provide funding and assistance to help you with your project.

More Information

- Usability Testing: Scenarios

EERE's Web Usability Coordinator can provide further examples, mentoring, and additional guidance on writing effective scenarios.

Usability Reviews

Usability reviews are a low-cost way to assess whether your website meets usability best practices and target areas for improvement. Here you will learn what usability reviews are and how to conduct an effective review.

What is a Usability Review?

A usability review, sometimes referred to as a heuristic evaluation, is a systematic inspection of a website, application, or wireframes/prototypes to judge how well each element of the user interface complies with a set of predetermined best practice guidelines ("heuristics"). The analysis results in a list of potential usability issues, often ranked in order of severity.

The methodology was developed by Rolf Molich and Jakob Nielsen in the early 1990s as a way to uncover usability problems with a design, and can be used throughout the design process—although it should not be used as a substitute for usability testing.

Pros and Cons of Usability Reviews

Advantages

Conducting a usability review will:

- Provide good ideas for improving the user interface using a low cost, comprehensive, and consistent approach
- Help you see how closely your design complies with usability best practices
- Catch some usability problems that can be corrected before going to the expense of bringing in actual customers for usability testing.
- Raise questions—How will our customers interact with this feature? What is their impression of the design? — that can influence the design of future usability tests
- Find problems that may not surface during a usability test due to the comprehensive nature of this activity.

Limitations

However, usability reviews have the following limitations:

- Usability reviews don't test customer performance. While they will tell you if your product meets usability best practices, they won't tell you about the user experience—e.g. Will customers have more success with this task flow or that one? Can the customers successfully complete their tasks? Are customers satisfied with their experience using the site?
- Evaluators must have some knowledge and experience with usability best practices and be well versed in your customers' knowledge, limitations, and tasks, or the evaluation may miss its mark.
- Design changes based exclusively on usability reviews (without the benefit of customer performance data from usability tests) could hinder the customer experience instead of helping it.

To account for the limitations of usability reviews, we often complete them after we have done user research to learn about our customers, and we typically pair them with usability tests, which help us understand the interaction between our design and actual customers.

When to Conduct a Usability Review

Usability reviews can be performed at any time during a product's lifecycle—when and how often you choose to perform them will depend on your informational needs, time, and budget.

Before a Redesign

Sometimes usability reviews are done on existing sites or applications to prepare for a redesign. The results are used to determine the necessity for a redesign and the areas of your site in greatest need of improvement.

During the Design Phase

You can also use usability reviews during the design phase of your project to get feedback on paper sketches, wireframes, or prototypes. You can then use the feedback to progressively improve the designs.

Addressing usability problems and correcting them in the design phase is easier and less expensive than addressing them after you've gone to the expense of developing the final product.

How to Conduct an Effective Usability Review

Here are some things to consider in planning and conducting your usability review:

- **Determine the purpose of your review.** Understanding what you hope to get out of the review will help you choose the depth of review and the right guidelines to work with.
- **Determine what guideline you will use.** Choose the guidelines (or heuristics) that are most appropriate to your project and customize them if necessary. There are many generic lists of guidelines to start with.
- **Determine who will complete the review.** Reviews are typically done by one to five evaluators who have some knowledge and experience with usability best practices. Nielsen recommends three to five based on research suggesting that multiple reviewers uncover more problems, although the number you choose will depend on your needs and budget.
- **Provide reviewers with relevant contextual information.** Give your reviewers details about your target audiences, a list of top customer tasks or scenarios, and your goals for the site. Going through the site using a set of realistic, research-based tasks can help focus the review and give you more meaningful results.
- **Collate and rate findings.** Reviewers should work independently and compare findings once they have finished. Findings can be rated based on severity to help prioritize site improvements.

More Information

- Nielsen Norman Group: How to Conduct a Heuristic Evaluation - Seminal article on this technique by Jakob Nielsen
- Nielsen Norman Group: 10 Usability Heuristics for User Interface Design – High level list of usability principals defined by Jakob Nielsen in 1995
- Usability.gov: Research-Based Web Design and Usability Guidelines – Extensive set of guidelines designed for government sites by the Department of Health and Human Services

EERE's Web Usability Coordinator can provide further examples, mentoring, and additional guidance on conducting a usability review.

Usability Testing

Usability testing is a helpful way to learn how your customers interact with your website or application, and especially where they struggle. Here you will learn what usability tests are, how to conduct effective tests, and how to get approval for your tests.

What Is a Usability Test?

Usability testing is a research activity designed to evaluate the usability of a website or application by observing representatives from your key audience(s) as they try to perform a set of realistic tasks using your site.

Testing a website or application with actual customers allows you to see what's working well for your customers and where they experience difficulty. The results of the test can be used by your team to improve the customer experience.

A typical one-hour test session consists of:

- **Pre-test interview questions** to learn more about the participant's background and knowledge
- **10-20 scenarios**, or very short stories, each of which asks participants to complete a realistic task using the site.
- **Post-test interview questions** and standardized metrics such as the System Usability Score (SUS) on Measuring Usability, which gather feedback about the participant's overall experience interacting with the site during the test.

Usability tests can be conducted in person or remotely via virtual meeting software. They can be moderated by a facilitator, with a note taker capturing data on what participants say and do, or they can be set up and deployed for your customers to complete on their own using web-based commercial software.

Pros and Cons of Usability Testing

Advantages

Usability tests collect both qualitative and quantitative metrics to evaluate the site, including:

- Task completion rates
- Time on task
- Pathways through the site
- Requests for help or hints
- Verbal comments.

The data you collect can help you:

- Understand how customers *actually* behave when trying to accomplish critical tasks using your site—actual performance is often different from what customers self report in interviews and surveys
- Quantify customer success in completing their tasks on your site, both in terms of finding information and accurately understanding it
- See roadblocks customers encounter, and understand *why* something is a problem
- Understand customer expectations for your site and measure satisfaction
- Prioritize improvements to your site by showing you the areas with the most room for improvement
- Catch major usability problems before going to the expense of building out your site (when done as part of the user-centered design process).

Limitations

The quality of the actionable feedback you get from usability testing is very high, and this typically makes up for the limitations. However, you should be aware that:

- Planning, conducting, and analyzing the results of usability tests takes time (and therefore costs more), so this should be planned into the project timeline. But you can generally scale the testing to meet your timeline and budget.
- You interact with fewer participants, so the data may not be completely representative of all your customers, and it won't be statistically significant.
- Testing in a conference room or lab takes users away from their normal environments, which could affect the results.
- An inexperienced facilitator who gives too many hints or asks questions in a biased way could influence the results.

When to Perform a Usability Test
Usability tests can be performed at any time during a product's lifecycle—when and how often you choose to perform them will depend on your informational needs, your timeline, and your budget.

Before a Redesign
Sometimes usability tests are done on existing sites or applications to prepare for a redesign. The results are used to determine the necessity for a redesign and the areas of your site in greatest need of improvement. The results can also be used to establish a baseline for the customer experience, against which the success of your improvements can be measured.

During the Design Phase
When using the user-centered design process to design or redesign a site, usability tests are typically performed during multiple stages of the development process. For example, you might first test your paper sketches or wireframes, update your design, and then retest an early prototype.

Iteratively testing your designs as they become more elaborate helps you catch more usability problems and correct them when they are easy to fix, as opposed to after you've gone to the expense of developing the final product.

Developing an Effective Usability Test
Here are some tips to help you develop an effective usability test:

- **Think about the purpose of your test.** Understanding your research questions and what you hope to get out of the test will impact the way you design the test.
- **Work with a usability expert.** Planning and conducting a good usability test is part science, part art. If you are new to this process, we strongly urge you to work with a usability expert for your first few tests—he or she will teach you the ropes and help you get the most out of your test. EERE's Web Usability Coordinator is available to help mentor you through your early projects at no cost to your office.
- **Decide how many participants you need.** Research by Nielsen and Landauer shows that testing with as few as 3-5 people will catch about 80% of the usability problems on your site. We recommend you test with 3-5 members from 2-3 key audience groups.
- **Recruit members of your actual audiences.** It's important to ensure that actual customers complete the test, so choose your recruiting methods appropriately. Typically, recruiting criteria comes from your customer profiles or personas, which result from user research activities. We often advertise our tests via our website and/or through appropriate listservs.
- **Ask participants to do realistic tasks.** For the most accurate, useful results, ask your participants to do realistic tasks that are representative of the tasks they would do in real life. Your task scenarios typically come from user research activities. See the Scenarios page for examples of common EERE scenarios and information on writing effective scenarios.
- **Get the appropriate approvals.** You'll need approval from the Web Governance Team and possibly the Office of Management and Budget (OMB). Learn more about getting the necessary approvals below.

A note about Personally Identifiable Information (PII): If you collect any information about a person, such as their name, phone number, or address, then your project is handling PII. Be sure you are clear on the rules for collecting and storing PII before you begin your project.

Getting Approval for Your Usability Test

All usability tests need approval from the Web Governance Team (WGT), and some will need approval from the Office of Management and Budget (OMB) as well.

Step 1: Web Governance Team

All test materials should be submitted to the Web Governance Team for approval. Schedule a meeting with WGT after your test script is prepared.

Step 2: Office of Management and Budget

OMB approval is necessary for usability tests that collect information from 10 or more respondents from the general public. OMB approval is not required if tests are conducted internally among federal staff. Government contractors are *not* considered federal staff members.

Submit your test materials to OMB after you have received WGT approval.

More Information

How to Conduct Usability Tests

- YouTube: Video of a Usability Test Session – 20 minute video of a usability test session from Steve Krug
- Usability.gov: Usability Testing – Benefits and factors affecting cost; best practices for developing your test, recruiting participants, data analysis, and reporting
- HowTo.gov: Website Usability Testing – Detailed fact sheet covering the basics, recruiting, test design, and operational details
- Usability Body of Knowledge: Usability Testing – Detailed information on planning, testing, and running usability tests
- User Interface Engineering: Seven Common Usability Testing Mistakes

Testing Early Prototypes

- A List Apart: Paper Prototyping – Article with useful pictures of the process

Recruiting Participants

- Ux Matters: Recruiting Better Research Participants
- Nielsen Norman Group: Why You Only Need to Test with 5 Users

Preparing Test Materials

- Writing Scenarios – Tips for writing scenarios and examples of EERE-specific scenarios
- Measuring Usability: Measuring Usability with the System Usability Scale (SUS)
- Measuring Usability: 10 Things to Know about Net Promoter Scores and the User Experience

Moderating the Test

- Usability Testing: Overcoming Fear of Moderating Usability Research Sessions
- Moderating Usability Tests – Presentation by Joe Dumas and Beth Loring

EERE's Web Usability Coordinator can provide further examples, mentoring, and additional guidance on conducting effective usability tests.

Card Sorting

Card sorting is a usability activity that helps you understand how users intuitively organize and label your site's content. Here you will learn more about what card sorting is, how to conduct an effective sort, and how to analyze your results.

What Is Card Sorting?

The goal of card sorting is to understand how our key audiences *expect* to find information on our site. We can use what we learn to design a site structure (or information architecture) that helps our customers find what they are looking for because it matches their mental models.

When conducting a card sort, participants from key audiences sort a series of topics from across your website into categories. The type of card sort you do depends on what you are trying to learn. For example:

Carbon fiber development success story
Reports describing research results on energy storage
Award received for R&D on cathodes for batteries
Cost-shared grants that are currently open for applications
Overview of DOE's Vehicle Technology research and development program
Facts about the transportation sector

Step 1

Take a quick look at the list of items to the left.

We'd like you to sort them into groups that make sense to you.

There is no right or wrong answer, just do what comes naturally.

Step 2

When you're ready, drag an item from the left to create your first group.

- **Open card sorts** ask participants to create groupings that make sense to them and to label the groups in their own words. Do an open sort when you want to understand how users intuitively organize and label content in preparation for designing or redesigning your information architecture.
- **Closed card sorts** ask participants to sort items into predefined categories. Do a closed sort when you are adding new content to an existing structure. Some researchers also use closed sorts to gain additional feedback after conducting an open card sort, but if you are looking to test a newly created architecture, tree testing is generally a better choice.

Card sorts can be done in person (one-on-one or in small groups) using note cards, or remotely using online tools.

Pros and Cons of Card Sorting
Advantages
The main strength of card sorting is in its use a formative technique for learning how users think about your content. *Card sorts will not spit out a new architecture for you*, but they can provide insight into:

- Trends and differences in the ways people group your content (by audience, topic, task, etc.), which can help you think about different ways you could organize and provide access to your content
- Ways to label your navigation so your customers can recognize and find it
- Communication styles or preferences among your audience groups
- Relationships between items, which can be useful in determining related content and cross-linking strategies
- Content that causes confusion for certain audience groups.

Online, remote sorts have some advantages over in-person sorts. Specifically:

- They are easy to set up and deploy, and researchers aren't required to facilitate sessions, which cuts down on cost and time.
- Anyone with internet access can participate, which boosts participation and allows participants to complete the sort on their own time.
- Online tools automatically capture and present the data through visual methods such as cluster analysis, which cuts down on analysis time.

Limitations

However, be aware that card sorting has the following limitations:

- It provides insights into how your customers think—but it will not automatically generate a new site structure for you (that is up to you!)
- It does not take customer tasks into account, so consider using tree testing to evaluate your architecture after you design it ensure that it is usable.
- Sometimes participants sort items based on superficial aspects instead of thinking about the meaning of the items.
- Analysis can be a bit tricky and time consuming, especially if there is little consistency between participants.

Online, remote sorts have these additional limitations:

- There is no moderator, so you don't have the opportunity to ask questions or understand why someone sorted the items in a particular way.
- Participants can't ask questions to ensure they are completing the sort correctly.
- Online software doesn't allow participants to add cards, put cards in more than one location, rename cards, or create subcategories (all of which can lead to useful insights).

To overcome the limitations of remote card sorts, consider conducting a small number of your sessions in person to get qualitative feedback on participants' grouping decisions.

Conducting an Effective Card Sort

Since our audience is national, we will focus here on preparing a remote card sort.

Planning Your Sort

Here are some tips to help you plan your sort:

- **Think about the purpose of your test.** Understanding what you hope to get out of your sort will help you pick the most appropriate topics for your cards.
- **Work with a usability expert.** Conducting, and especially analyzing, a good card sort can be a little tricky. If you are new to this process, we strongly urge you to work with a usability expert for your first sort—he or she will teach you the ropes and help you get the most out of your test. EERE's Web Usability Coordinator is available to help mentor you through your early projects at no cost to your office.
- **Decide how many cards to use.** Ideally, this activity should take people 15-20 minutes, so we recommend including 30-50 cards in your sort, since our information is often technical in nature and therefore complex to sort.
- **Decide how many participants you need.** The research on this varies, but as a rule of thumb, we recommend you target 15 per audience group, at least 20-30 per sort.
- **Recruit members of your actual audiences.** It's important to ensure that actual customers complete the sort, so choose your recruiting methods appropriately. Typically, recruiting criteria comes from your customer profiles, which result from user research activities. We often advertise our tests via our website and/or through appropriate listservs.
- **Get the appropriate approvals.** You'll need approval from the Web Governance Team and the Office of Management and Budget (OMB). Learn more about getting the necessary approvals below.

A note about Personally Identifiable Information (PII): If you collect any information about a person, such as their name, phone number, or address, then your project is handling PII. Be sure you are clear on the rules for collecting and storing PII before you begin your project.

Creating Your Cards

1. Inventory existing or future content. Flag content that addresses user top tasks and business goals.

2. Select 30-50 topics from the inventoried content and create a series of card "labels." The content you select should:
   - Represent customer and website goals
   - Represent the breadth and depth of the site
   - Represent existing and potential information
   - Span information types (e.g. forms, applications, how do information, etc.)
   - Be at the same level of granularity (don't pick a whole section for one card and the title of a publication for another)
   - Include enough cards of a given type for groups to be formed.
3. Edit card labels for leading clues. For example:
   - Avoid existing structures and language of the interface
   - Avoid format words (i.e. "form" or "manual")
   - Avoid repetitious terms that lead to artificial grouping (i.e. "list of" or "research on")
   - Use synonyms (e.g. license versus permit).

Pilot Testing Your Card Sort

Be sure to pilot test your sort with a few internal people who know your audience before you deploy it to your customers. Ask your testers to let you know:

- How long the sort took them
- If there were any cards they found confusing or ambiguous
- If there were any cards they found difficult to sort.

It is often helpful to sit by a colleague and ask him/her to "think out loud" as they complete the sort—areas where there are problems will become apparent.

Getting Approval for Your Card Sort

All card sorts need approval from the Web Governance Team (WGT), and most will need OMB approval as well.

Step 1: Web Governance Team

All test materials should be submitted to the Web Governance Team (WGT) for approval. Schedule a meeting with WGT after your list of cards is prepared.

Step 2: Office of Management and Budget

Office of Management and Budget (OMB) approval is necessary for card sorts that collect information from 10 or more respondents from the general public. OMB approval is not required if tests are conducted internally among federal staff. Government contractors are *not* considered federal staff members.

Submit your test materials to OMB after you have received WGT approval (and preferably after you have done a pilot test to ensure that the sort you constructed works as you expect).

More Information

- Usability.gov: Card Sorting – Process for conducting online and in-person sorts; tips on analysis
- Boxes and Arrows: Card sorting: A Definitive Guide – Card preparation, execution of in-person sorts, data analysis
- Ux Matters: Comparing User Research Methods for Information Architecture – Pros and cons of different card sorting methods and tree testing; discusses how open card sorting, tree testing and prototype testing should be used in combination to create a successful user interface
- Ux Matters: All About Card Sorting: An Interview with Donna Spencer – Advice on how to conduct sorts and how to use the data
- Nielsen Norman Group: Card Sorting - How Many Users to Test?
- Ux Matters: Dancing with the Cards - Quick-and-Dirty Analysis of Card Sorting Data

- [Journal of Usability Studies: Card Sort Analysis Best Practices](#) – Step by step details on how to analyze card sort data and turn it into an information architecture.

Creating an Information Architecture After Card Sort Analysis

- [Usability.gov: Organization Skemes](#) – Different ways of categorizing your content
- [Usability.gov: Organization Structures](#) – Different ways of defining relationships between content

EERE's Web Usability Coordinator can provide further examples, mentoring, and additional guidance on conducting a card sort and analyzing your results.

Tree Testing Your Information Architecture

Once you've developed your site's new structure (or *information architecture*), it's smart to tree test it to ensure it will work for your customers before starting your design. Here you will learn what tree testing is, how to conduct an effective test, and how to analyze your results.

What is a Tree Test?

Tree testing is technique for evaluating the findability of content within your information architecture. It is typically done after you have drafted a site structure (hopefully based on the results of a card sort), and before going into the design phase of your project.

In a typical tree test, participants are given a task and asked to navigate through a hierarchical list ("tree") of topics and subtopics to identify where they would find a piece of information. Testing on a simplified outline of your site's structure helps ensure that the structure itself makes intuitive sense to your audience before you add the overlay of design and navigational aids.

Tree tests can be done in person or remotely using online tools.

Task 2 of 19

As an analyst for a business research company, find success stories

- ▼ Home
  - About
  - Research
  - Testing, Modeling and Analysis
  - Electric Vehicles
  - Funding
  - Outreach
  - Regulatory
  - News
  - Events

Pros and Cons of Tree Testing

Advantages

- Tree testing allows an early focus on the site structure in the absence of content and design, which helps you make decisions about content organization and labels before adding more complexity to your site.
- Many researchers prefer tree testing over closed card sorts because tree testing gets participants into the mind set of completing a task instead of just grouping information. A task-based approach more closely approximates the way people navigate through websites.
- Tree testing lets you test multiple levels of your architecture instead of just the main groups (unlike closed card sorts).
- Remote tests are easy to set up and fairly quick to analyze because they automate data collection and some analysis. This allows you to test multiple iterations of your architecture until you are satisfied with your customers' task success rates.
- Remote tests allow anyone with internet access to participate, which boosts participation and allows participants to complete the study on their own time.

Limitations

- Tree testing doesn't take navigation design or other interface elements that might affect content findability into consideration. That is why it is important to usability test your design prototypes in addition to tree testing.
- There is no moderator, so you don't have the opportunity to ask questions or understand why people answered the way they did.
- Participants can't ask questions to ensure they are completing the sort correctly.

Conducting an Effective Tree Test

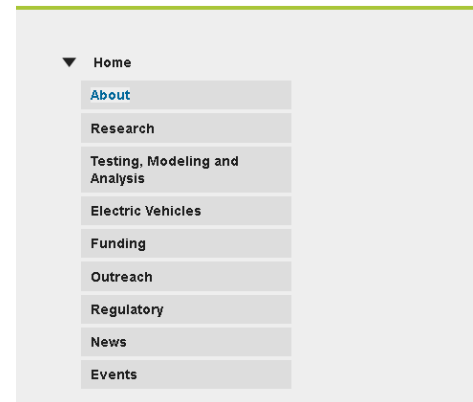Since our audience is national, we will focus here on preparing a remote tree study.

Planning Your Test

Here are some tips to help you plan your tree test:

- **Think about the purpose of your test.** Understanding your research questions and what you hope to get out of the test will impact the pre/post test questions and scenarios you use.

- **Decide if you'll run multiple tests for audiences with distinct tasks.** If you have audience groups with very distinct tasks, consider setting up different tests for each group. If your audience tasks overlap, you can use pre- and post-test questions to filter your data after you collect it.
- **Decide how many participants you need.** We recommend you strive for 30-50 minimum; 50-120 is optimal for seeing patterns. If you have multiple audience groups taking the test, look for 25 or more from each group.
- **Decide how long the test should be.** We suggest you shoot for 10-15 minutes.
- **Recruit members of your actual audiences.** It's important to ensure that actual customers complete the test, so choose your recruiting methods appropriately. Typically, recruiting criteria comes from your customer profiles, which result from user research activities. We often advertise our tests via our website and/or through appropriate listservs.
- **Get the appropriate approvals.** You'll need approval from the Web Governance Team and the Office of Management and Budget (OMB). Learn more about getting the necessary approvals.

A note about Personally Identifiable Information (PII): If you collect any information about a person, such as their name, phone number, or address, then your project is handling PII. Be sure you are clear on the rules for collecting and storing PII before you begin your project.

Developing Test Materials
Here are some tips to help you develop your tree testing materials.

- **Write realistic task scenarios.**
  - For the most accurate, useful results, ask your participants to do realistic tasks that are representative of the tasks they would do in real life. Your task scenarios typically come from user research activities. See the Scenarios page for examples of common EERE scenarios and information on writing effective scenarios.
  - Scenarios for a tree test should be very short—typically one sentence.
  - Give each participant 6-10 scenarios, depending on the size of your tree (participants start to learn your tree structure after a while, which can cause falsely positive results).
  - You can write more scenarios than each participant will try to do; simply select a number to give to each participant and Treejack will randomly select that number from the bank of scenarios you upload.

- **Develop pre- and post-test questions that will help you segment your audiences.**
  - Pre-test questions might include information on who the participant is or how often they use the site, for example. Ask multiple choice questions instead of open text so you can filter test results based on the responses.
  - Post-test questions typically ask for feedback on a participant's overall experience using the new architecture (e.g., How would you rate the ease of choosing an appropriate category for the questions you were asked? As you went through the test, did you find anything to be particularly confusing? Do you have any additional suggestions for specific categories?)
  - Keep the number of pre/post questions to a minimum (2-4 total), and be sure wording is clear and concise.

- **Modify your information architecture for the testing, if necessary.** You may need to modify your information architecture slightly for the purpose of getting better data for the test. When setting up the test, review your architecture for hidden topics or "singletons" (levels with only one answer). For example, if you have a page that includes contact information for your office as well as links to DOE and EERE contact information, your tree for the test should be:

       Contacts
              Geothermal Technologies Office
              Energy Efficiency and Renewable Energy
              Department of Energy

Even though the architecture you use on the site might look like this:

Contacts
Energy Efficiency and Renewable Energy
Department of Energy

Setting Up Your Test in Treejack
There are a handful of tree testing tools available; however, EERE typically uses Treejack, which allows you to set up pre- and post-test questions and offers reports to help with data analysis. There are a few tricks to setting up your test in Treejack:

- **Cut and paste your final architecture into Treejack.** Be sure your architecture is finalized and correctly indented to reflect relationships between topics before pasting it into Treejack.
- **Set up scenarios and select the answers.** After you set up the tree, enter your scenarios and choose one or more correct answer choices for each scenario. Note that you can go back and select additional correct answers during or after the test and re-tabulate your results.
- **Randomize the scenarios.** Consider randomizing the order in which the scenarios are presented to participants to reduce biases introduced as participants learn the tree.
- **Allow participants to skip scenarios.** Don't force participants to complete a scenario they wouldn't normally do or aren't sure about, or your data may not be accurate.
- **Make a copy of your test before launch.** Once the test is launched, revisions cannot be made.

Contact the EERE Web Usability Coordinator if you'd like to use Treejack to conduct your test. You will be provided access to the tool so you can set up your test and run reports after the data is collected.

Pilot Testing Your Tree Test
Be sure to pilot your test with a few internal people who know your audience before you deploy it to your customers. Ask your testers to let you know:

- How long the test took them
- If there were any questions or scenarios they found confusing or ambiguous.

It is often helpful to sit by a colleague and ask him/her to "think out loud" as they complete the test—areas where there are problems will become apparent.

Getting Approval for Your Tree Test
All tree tests need approval from the Web Governance Team (WGT), and most will need OMB approval as well.

Step 1: Web Governance Team
All test materials should be submitted to the Web Governance Team for approval. Schedule a meeting with WGT after your test is prepared.

Step 2: Office of Management and Budget
Office of Management and Budget (OMB) approval is necessary for usability tests that collect information from 10 or more respondents from the general public. OMB approval is not required if tests are conducted internally among federal staff. Government contractors are *not* considered federal staff members.

Submit your test materials to OMB after you have received WGT approval (and preferably after you have done a pilot test to ensure that the test you constructed works as you expect).

Analyzing Your Results

Take time with your analysis, and look at the results from several different angles. There are two ways to look at your data with Treejack—using the tool's built in reports and downloading the data into a spreadsheet. Both have their advantages and can help you dig into different aspects of the data.

When analyzing your data, try to assess:

- How successful were participants in finding the right answer to each scenario?
- How direct was the participants' path to finding the information? Did they have to backtrack?
- If they weren't successful, where did they go astray?
- Were they able to do the tasks quickly, without having to think too much?

You can filter the results using your pre- and post-test questions to look for differences in performance between different segments of your population (between audiences, for example). If the results of the first tree test require drastic changes to your information architecture, consider rerunning the test with your new architecture to verify that the changes you made were successful.

More Information

- Ux Matters: Comparing User Research Methods for Information Architecture – Compares tree testing to closed card sorting when testing information findability and discusses how open card sorting, tree testing, and prototype testing should be used in combination to create a successful user interface
- Boxes and Arrows: Tree Testing: A Quick Way to Evaluate Your IA – Genesis of tree testing, how to analyze your results, and lessons learned
- Ux Matters: Review of Information Architecture Evaluation Tools: Chalkmark and Treejack
- Boxes and Arrows: Card-Based Classification Evaluation - Method for in-person tree testing with cards (from which online tree testing was created)
- Optimal Workshop: Webinar - Getting Started with Tree Testing - How to get up and running with Treejack quickly and avoid common mistakes
- Optimal Workshop: Webinar - Advanced Tree Testing – Using the more advanced Treejack features

EERE's Web Usability Coordinator can provide further examples, mentoring, and additional guidance on conducting a tree test and analyzing your results.