

Reference number: 10-4011 NCI

Title of Evaluation Project: Evaluation of Team Science Toolkit Website

Title of Report: Summary of Team Science Toolkit Usability Testing Activities

Supported by NCI 2010-2011 Set-Aside Funding

NCI contracted with Westat to conduct the following activities to support the development and testing of the Team Science Toolkit between September 2010 and March 2011:

- 1. Heuristic Review:** The intent of the heuristic review was to examine the TS Toolkit website and judge its compliance with a standard set of usability principles. Results of the analysis listed potential usability issues or problems, and recommended revisions that would bring the website into compliance with widely accepted usability heuristics.
- 2. Review of Other Relevant Web Sites:** This review assessed the content and functionality of websites with content or functionality similar to the Team Science Toolkit. The purposes were (1) to understand what equivalent sites are operating, (2) to identify what additional content and functionality of these other sites may be useful to include in the TS Toolkit Website, and (3) to carve out a unique niche for the Toolkit to distinguish it from the existing other websites.
- 3. Iterative Usability Testing:** The study employed individual usability test sessions that were designed to collect feedback on the site's information content and functionality while users worked with the Toolkit in real time. Outcomes and recommended revisions were generated after each testing round to inform the website development team of elements of the website that could be enhanced to more closely match site users' needs and expectations.

I. Heuristic Review

In September 2010, Westat conducted a heuristic review of the Team Science Toolkit website. A heuristic review is a usability expert's evaluation of a particular website, guided by a checklist of usability principles ("heuristics"). Heuristic reviews are commonly conducted as part of an iterative design or redesign process. The objective is to identify potential usability problems and then prioritize them for correction in subsequent steps of the website design/redesign process. Heuristic reviews are also often conducted before scheduling usability tests, in order to identify and correct any serious issues before testing site performance with real users under semi-realistic conditions. Westat conducted a heuristic evaluation of Team Science Toolkit in September 2010 in which the design of the site was matched against Jakob Nielsen's 10 usability guidelines (1993, 2000, 2008). Nielsen's heuristic guidelines include analysis of the website according to the following usability standards:

1. Visibility of system status
2. Match between system and real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency
8. Aesthetic, minimalist design
9. Users' ability to recognize, diagnose, and recover from errors
10. Help and documentation

Westat provided NCI with a heuristic review report that provided a structured assessment of the strengths and weaknesses of each webpage (citing the heuristics) on the Toolkit, as well as recommendations for improving usability. Recommended revisions included moving search functions where they could be more clearly distinguished on various web pages, modifying colors and graphics to ensure sufficient contrast between text and page background, adding instructions and examples on search pages to help users understand correct input formats, and adding links to the home page to enable users to more quickly reach core informational pages on the website.

You can access full results of the heuristic review in Appendix A and Appendix B.

II. Review of other relevant Web Sites

This review identified a handful of websites with relevance to the Team Science Toolkit, including td-net, teamscience.net, and the Toolbox Project. It also identified similar NIH-supported websites that build online communities via user groups and bulletin boards. This review identified that the TS Toolkit is unique. The review showed that no other websites on team science aimed to provide the same services to consolidate and integrate knowledge in the SciTS field, and coalesce the community of stakeholders interested in team science via an online community. Websites were identified that provided bibliographic citations relevant to team science (td-net), and that provided online training modules in competencies for team science (teamscience.net). But none filled the same roles of consolidating both published and unpublished resources in one location and coalescing the community of SciTS stakeholders. The review of websites identified that user groups and bulletin boards can be a problem to maintain, suggesting that these features should be kept to a minimum on the Toolkit website. As a result, the linked listserv became the central focus of efforts to engage the SciTS community in dialogue, and that has proven to be a successful approach (as opposed to bulletin boards and user groups).

III. Usability Testing Rounds 1 & 2

Westat conducted two rounds of usability testing of the Team Science Toolkit website between December 2010 and February 2011 under contract with the National Cancer Institute (NCI). NCI had originally proposed three rounds in the funding plan, however only two rounds were found to be necessary, and fit with the website's development schedule for its planned demonstration at an

international team science conference in April 2011. Each round of testing was conducted to achieve the following goals:

- Ensure that the Toolkit adheres to widely accepted website usability standards;
- Ensure that the Toolkit effectively communicates information about team science to its targeted users;
- Gain an understanding of the strategies that site users employ when searching for information about team science using the Toolkit and when trying to access resources on the site;
- Gain an understanding of the strategies that site users employ when they want to share information that they have about team science with the team science community using the Toolkit;
- Provide NCI with feedback from users with varying levels of understanding about team science about ways the site could be enhanced to most effectively meet their information needs and expectations; and
- Provide recommendations about enhancements that could be made to support frequent and effective usage of the Toolkit.

The methodology and outcomes from each testing round are described below.

ROUND 1

Actual Start Date: December 13, 2010

Actual Completion Date: December 21, 2010

Study Design & Methods: In Round 1 of the usability tests, the research team used lists of names provided by NCI to recruit four novices who were relatively unfamiliar with team science, and four experts who had expertise and experience in the field. Eight individual interview sessions were conducted remotely using Web Ex online meeting software, and each session lasted about 90 minutes. The participant worked with the Team Science Toolkit using a personal computer while a session moderator led the interview and observed the participant's on screen actions remotely via Web Ex. A session notetaker remotely observed the session using a third computer to note the participant's on-screen movements. The notetaker recorded the time it took the respondent to use the Toolkit to complete a series of user tasks. User tasks included searching for information about team science on the website, accessing and downloading resources, and uploading tools on to the site to share with others. During the session, the moderator encouraged the participant to "think aloud" while carrying out each of the various user tasks. The think aloud approach enabled the research team to (1) gain insight into the participant's views about the strengths and weaknesses of the Toolkit; (2) study the participant's expectations about how the content of the site should be organized; and, (3) observe the strategies that the participant used to try to find information and

resources posted on the web site and to work with certain functions (e.g., upload a file onto the Toolkit). Throughout task completion, the moderator prompted the participant with questions that explored thinking and strategies as each task scenario was carried out. The participant was asked to describe reasons for clicking a link, conducting a search, or taking some other action, and was encouraged to express whether the behavior of the web site matched expectations. During testing, the evaluation team noted specific portions of the web site that seemed to be associated with the participant's hesitation and confusion. The moderator debriefed the participant after task completion to collect detailed feedback about the user's experience working with the Toolkit.

Key Findings/Results: Reactions to the Toolkit by both novices and experts were mainly positive. Participants from both groups liked the amount and variety of information that the Toolkit offered and thought the information content met their expectations. Most were happy with the general layout and design of the website and many (all of the experts and a few novices) planned to use the Toolkit once it was made publicly available. In terms of site navigability, many participants were able to find an appropriate link to the information they sought to complete the user tasks right from the home page. However, a combination of researchers' observations and direct comments from participants indicated that most participants needed to work with the site a little and become familiar with its information architecture¹ in order to find the information or complete the action (e.g., upload a file onto the Toolkit) targeted by some of the user tasks. Once they became familiar with the site's architecture after completing a few tasks, most test users were able to find the information they sought. Negative feedback from participants about the site were related to their needing to scroll to view and find information on content heavy pages, and confusion that some experienced when searching for "tools" and "measures/instruments" on the Advanced Search page. The latter finding about users' difficulties with site terminology and the Advanced Search feature was particularly significant. The Toolkit is designed to be a "Wiki-based" website that enables users to access a database of information and resources about team science, and the terms "tools" and "measures/instruments" are among the primary resource categories that users select from to direct their search queries. Participants from both groups used the Advanced Search feature more often than any other search function on the website, and some commented that using Advanced Search took a bit of learning. The Advanced Search feature was accessible through a variety of links on the Toolkit, and users seemed to need to complete a few different user tasks to adapt to the different options that were available to refine a search on that page. Once they became familiar with the steps that were required to conduct an advanced search, and saw the kinds of resources that appeared as results when they selected "tools" or "measures/instruments" as the resource type, most participants eventually found what they wanted on the site.

Conclusions/Recommendations/Future Directions: While user feedback about the Toolkit was positive overall, a few important usability issues were identified during Round 1. Westat provided NCI with a list of detailed recommendations to inform the project team about ways the design and content of the Toolkit could be enhanced to better support the needs and expectations of targeted users. The following were among the most significant recommendations that were generated from Round 1 testing:

¹ A website's "information architecture" informs users about the different categories of content that the site provides. Users rely upon the navigation links on the website's home page to learn about the kinds of information that are available on the website. (see www.usability.gov)

1. *Consider rewriting the text on the Toolkit Home Page.* It was recommended that the descriptive text on the home page be rewritten so that it accomplished two principal goals: (1) acquainting the novice user with the concept of team science rapidly, before the term is used in site content, and (2) explaining the purpose of the web site, either on the home page or on a separate page on the site.
2. *Make the top menu of searchable resources on the Advanced Search page more salient.* Many test users overlooked a menu of selectable resource options (e.g., tools, measures/instruments, bibliography) that appeared at the top of this page and just worked with the resource type that had been selected by default from the link they had clicked to reach the Advanced Search page. It was suggested that the design of the resource options menu on the Advanced Search page could be enhanced so users could more easily recognize which resource was currently selected and make it apparent that they had other options to select from.
3. *Clarify the terms “tools” and “measures/instruments”.* It became apparent during testing that some users did not define the terms “tools” and “measures and instruments” in ways that matched how these terms were used in the Toolkit to define resource types in the database. Some test participants from both user groups did not see a clear difference between these terms, and became confused when they needed to select one of these terms to search for or upload resources onto the Toolkit database. Some test users considered surveys to be “tools”, and were confused when surveys did not appear among search results when they had selected “tools” as the resource type. The evaluation team suggested that changing “tools” and “measures/instruments” to more directly descriptive terms, such as “publications and documents” and “surveys and other instruments” might help facilitate users’ understanding of the kinds of items that are available as resource types in the database.
4. *Clarify or redefine the purpose of the “Find Resources” search box.* A “Find Resources” search feature appeared in the upper right of the home page and on other core web pages on the website. Test participants did not understand what the term “resources” meant in this context, or what kind of search would result from using this feature, as opposed to using Advanced Search.
5. *Reduce the need for scrolling content-heavy pages.* Having to scroll to view the information on content heavy pages was a point of frustration for many participants. It was suggested that anchor links could be used to display the various sections of content heavy web pages and allow a user to skip to a particular section without scrolling the whole page.
6. *Consider rewording and/ or repurposing the links “Engaging in team science” and “Studying team science”.* Some users did not seem to understand the purpose or relationship between the links labeled “Engaging in team science” and “Studying team science” that appeared on the home page during Round 1, or the purpose of links that appeared below each of these in smaller font. It was recommended that these links should be more clearly labeled (e.g., “Learn more about team science”) so users could more easily

identify the content of the pages that would be reached and that these links should all appear in the same size font.

7. *Provide a link on the home page for users who want to learn more about what team science is.* The version of the Toolkit that was tested during Round 1 included a headline on the home page that read, “The Team Science Toolkit provides resources to support the practice and study of team science”, and a link labeled “What is Team Science?” Neither of these appeared to be helpful for test participants who were not confident in their understanding of the term “team science,” and the link “What is Team Science?” seemed only to confirm that the user might not know much about the term. The evaluation team suggested that that the headline text could be replaced with a more concise definition of team science, and the link labeled “What is Team Science?” could be re-labeled as “Learn more about team science”.

ROUND 2

Actual Start Date: January 31, 2011

Actual Completion Date: February 4, 2011

Study Design & Methods: A second round of testing was conducted in early 2011 to learn how updates made to the Toolkit had addressed the usability issues that were identified during Round 1 testing, and to identify any outstanding issues related to site navigability and information content. The same recruitment and testing protocols that were used during Round 1 were also used during Round 2 testing; however, specific website features were targeted for user feedback in Round 2. These included a revised home page, a newly added “About the Toolkit” webpage, the website registration process, the “Commentary” webpage, and the “Add a comment” feature on the resource attributes page.

Round 2 testing was conducted with a total of nine people. Participants included four novices who NCI had identified as having no knowledge or some knowledge and experience with team science, and five experts who represented individuals who had some knowledge or substantial knowledge and experience with team science. The group of participants that represented experts in team science was subdivided into three types for Round 2 testing: Experts Studying Team Science (2), Experts Practicing Team Science (1), and Experts Supporting Team Science (2).

Key Findings/Results: Participants from the second round of testing tended to offer positive feedback about the Toolkit. As was the case in Round 1, test users were pleased with the types and variety of information that were available on the Toolkit and many (all experts and a few novices) planned to visit the website in the future. Updates that had been made to page formatting, labeling and general information architecture appeared to have resolved many of the usability issues that had been identified during Round 1, especially on the Advanced Search page. Users liked the placement and labeling of section links at the top of the home page and found the information on the “About the Toolkit” page to be useful. The Toolkit home page had undergone a rather significant redesign for Round 2 with the addition of two search options (“Search by Type of Resource” and “Search Resources by Your Goal”), and this change

introduced a few new usability issues. While test users liked having a variety of search options, many thought this was more than they actually needed, and that their placement on the home page made the page look cluttered and required that they scroll down the page to view all of the home page content. While anchor links had been added to a few pages, some of the web pages on the Toolkit were still a bit content heavy and required users to scroll down to view content below the fold. The process by which users uploaded a file on to the Toolkit had been modified a bit for Round 2 with the addition of an “Add to the Database” link on the home page and the corresponding “Contribute to the Toolkit” webpage. Participants liked the new link to this feature on the home page, and needed to select a resource type (e.g., tools, measure/instrument, bibliography) to launch the upload process from the “Contribute to the Toolkit” webpage. However, continued uncertainty about what constituted a “tool” left most users confused about which option they were supposed to choose to upload certain types of files. It also became apparent during Round 2 testing that users did not recognize a difference between a resource’s attributes page and its bibliographic reference page, and many became confused when they were unable to find information or conduct an action on a bibliographic reference page that they had been able to find/do on the resource’s attributes page.

Conclusions/Recommendations/Future Directions: Westat provided NCI with a summary of outcomes and recommended changes that should be made before the Toolkit was demonstrated at a national team science conference in April 2011. Three critical issues were identified during testing that were related to the overall design of the Toolkit and that appeared to have had a significant impact on users’ abilities to recognize and comprehend certain portions of the site. The following were recommended for future discussion by NCI and the Westat development team:

1. *Users tended to approach conducting a search for information on the Toolkit with a “Google” search mindset.* Most test users in both rounds wanted to start their searches for information on the Toolkit similar to the way they would do so on familiar sites like Google and Pub Med – by beginning broadly by entering keywords and terms they already knew into a general search box. If this broad search did not yield the results they hoped for, then they might try a more targeted search. A “Search the Database” box that appeared midway on the Toolkit home page during Round 2 and the resulting list of results gave users a cue that this kind of preliminary, broad-based search was available. However, if users began their search by first clicking on the “Search the Database” or “Advanced Search” link, the design of the resulting “Advanced Search” page was more complex than most were expecting to see for a first-level search, and contained the kinds of detailed options they would seek (e.g., check boxes and resource types) if their initial, broad-based search did not deliver the results they had wanted. Similarly, the more targeted search options available under “Search by type of resource” and “Search Resources by your goal” were the kinds of things that most Round 2 users had expected to see among options they could choose from later on if they wanted to conduct a more detailed search after their initial, broader search attempt.
2. *Users were not seeing a distinction between “Tools” and other terminology on the site.* Users in both rounds of testing grappled with what was considered a “Tool”. The descriptions that were offered on the “About the Toolkit” page during Round 2 seemed to

be somewhat helpful, but many still saw overlap between “Tools” and “Measures/Instruments”. This confusion about the term was most noticeable during Round 2 testing, and impacted how those test users worked with the site.

Both rounds of testing demonstrated, and usability heuristics support, that website users, particularly novice and “casual” (occasional) users, should not be expected to make an effort to learn the nuances of site-specific terminology² (e.g., “tools”, “measures”). Most users of any website intend to arrive at a site, readily identify the pathways that will take them quickly to what they want/need on the site, access the information, and move on. Those that find they are unable to do this on the Toolkit or any other website might move on to another resource that enables them to more easily access the information they seek.

3. *Bibliographic entries were not recognized as distinct from other resources.* Test users had difficulty recognizing the difference between the purposes of a resource’s attributes page and its bibliographic reference page. The design and formatting of these pages were quite similar, so differences between them were not easy to distinguish. Different kinds of information and features were available on these pages, so it was important for users to recognize that they were not the same. Often, users came across information on a resource’s bibliographic reference page that they expected to be able to open and/or download the same way they could on the resource’s attributes page. Additionally, users did not recognize that certain kinds of materials (e.g. journal articles) were not available to upload or download due to copyrighting and other material rights. Westat suggest that further discussion was warranted with NCI to determine (1) how to best approach informing users about the distinctions between bibliographic and other resources on the Toolkit; and, (2) how to inform users about the availability (or lack) of published and/or copyrighted materials on the site.

IV. Summary of Conclusions across Activities

Outcomes from the activities funded by the Set-aside funds informed the Toolkit website development team how the overall site design, content, and functionality could be enhanced so the site can meet users’ information needs and expectations. Recommendations from each activity were described in detailed reports, and led to a dramatic redesign of the website over a 6-month period. Key outcomes from the activities funded by the Set-aside funds included:

- Identification of usability issues related to site design and functionality and recommendations for improvement in these areas;
- Identification of ways the website design and functionality could be improved to enhance the user’s experience working with the website;

² <http://www.usability.gov/pdfs/chapter1.pdf> See U.S. Department of Health and Human Services (2010). *Usability testing, Chapter19: Understand and meet users’ expectations.* Available at

- Provision of recommendations for revisions to the website that were implemented for the April 2011 launch of the beta version at the Third Annual International Science of Team Science Conference, in Chicago, IL;
- Provision of recommendations for additional revisions to the website that were implemented between May and October 2011, and that were integrated into the final design of the website, which will be launched at the October 2011 Annual Conference of the American Public Health Association;
- Development of a much enhanced website overall from initial design to final product.

REFERENCES

Nielsen, J. (1993). *Usability engineering*. Boston, MA: Academic Press.

Nielsen, J. (2000). *Designing web usability*. Indianapolis, IN: New Riders.

Nielsen, J. (2007). *Breadcrumb navigation increasingly useful*. Posted on Jakob Nielsen's Alertbox, April 10, 2007. See: <http://www.useit.com/alertbox/breadcrumbs.html>