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EP6 Evaluation Plan

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Abstract

EP6 will be released for evaluation on November 20, 1995; the evaluation will continue through to January 31, 1996. Usability testing and an on-line user survey, the Comment Survey Tool (CST) have been chosen as the two methods of evaluation. Each method complements the other. Usability testing will be conducted in a controlled environment that allows for observed and measured user response for evaluation of design efficiency. The CST provides the opportunity to measure important aspects of user needs, preferences, and comments without significant investments in time and workspace. This method of evaluation is designed so that evaluators can access the EP6 at their own convenience. Evaluators have been selected by non-ECS personnel and represent, or who are in fact, ECS end-users.

The results of both the usability test sessions and the CST survey will be compared. The data analysis of the usability testing, the survey, and the comparison between the two will each be summarized in a chapter of the EP6 Evaluation Results Report, to be published by the end of February, 1996.

Keywords: Evaluation Package 6, EP6, Usability Testing, Survey, CST, Comment Survey Tool

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1. Introduction

1.1 Purpose

This paper describes the two evaluation methods that will be used to evaluate Evaluation Package 6 (EP6): usability testing and user survey. Descriptions for the implementation of usability tests for EP6 and the on-line user survey, known as the Comment Survey Tool (CST), are provided. The data analysis schedule for these two data collection methods is given. In addition, a brief discussion and outline of the two types of EP6 Demonstration Scripts is provided.

1.2 Organization

This paper is organized as follows:

Chapter 2 introduces the Evaluation Package 6 (EP6), usability testing, and the Comment Survey Tool (CST). Chapter 3 provides definitions of terminology used throughout the document as well as examples of lessons learned from previous usability test sessions. Usability Testing methodology, goals, environment, and tasks are detailed in Chapter 4, followed by the information on the CST pertaining to the same categories listed in Chapter 5. Also provided in Chapter 5 is information on the EP6 results and data distribution policy. Chapter 6 relates to the two Demonstration Scripts that will be employed by EP6 Evaluators to learn about EP6 and view some of the capabilities of the system.

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2. Overview

EP6 will be released for evaluation on November 20, 1995; the evaluation will continue through to January 31, 1996. EP6 will be evaluated using two methods: Usability Testing and an Independent Evaluator Survey implemented in EP6 as the Comment Survey Tool (CST). The usability test is administered in a controlled environment that allows for observed and measured user response for evaluation of design efficiency. The second evaluation method allows evaluators to input their user preferences and suggestions to the CST, an on-line user survey in an independent, or uncontrolled environment.

These two methods were chosen in order to provide increased depth and breadth in the data collected during the evaluation period. Each method complements the other as each has its own strengths. Because usability testing is conducted in a controlled environment, variables such as time to access the system, order of user tasks, the amount of help provided can be controlled, in addition, reliable user statistics can be collected. The drawbacks to this method are that it is time consuming and can generate a significant amount of data. One of the most notable advantages of usability testing is that it enables the system developers to directly observe the way users use the system. Because of these factors, test sessions must be carefully prepared for and smoothly orchestrated for maximum effectiveness.

The Comment Survey Tool provides the opportunity to measure important aspects of user needs, preferences, and comments without significant investments in time and workspace. This method of evaluation is designed so that evaluators can access the EP6 at their own convenience, this alleviates the requirements for a dedicated test environment, travel, etc. Another advantage is that the evaluators will be able and encouraged to access EP6 a number of times during the evaluation period. This will provide information on how users' perceptions of EP6 change over time, the amount of time it takes to learn how to operate various EP6 functions, and how use of EP6 at different times of the day and with different system loads affects user perception of EP6. However, the users entering their comments into the CST will each have a unique experience using EP6, therefore it may be difficult to isolate some perceived and actual problems the users encountered using EP6.

For a description of EP6 functional content and physical configuration, consult the following:

- EP6 Design Review Presentations
(<http://edhs1.gsfc.nasa.gov:8001/waisdata/toc/pp7220701toc.html>)
- ECS Evaluation Packages Strategic Plan - EP6 Version (222-WP-003-001)

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3. Background

3.1 Key Terms Used in This Document

Usability Participants are those who represent, or who are in fact, potential end users of the ECS. EP6 Participants will also include experts on usability and human factors research from the University of Maryland at College Park and Goddard Space Flight Center. They will evaluate the EP6 through formal usability test sessions during which they will be given defined tasks to accomplish in a certain order. The test sessions will be conducted in a controlled environment. Data collected from these evaluators will be in the form of observations made by the Observers and Facilitator during usability testing, in addition to Participant comments and survey responses as recorded in the CST.

Independent Evaluators are those who represent, or who are in fact, potential end users of the ECS. As opposed to evaluating the EP6 through usability testing they will access EP6 at their own convenience, using their own resources, in an uncontrolled, or independent environment. The Independent Evaluators have been selected by non-ECS personnel and have experience as Version 0 Tire kickers, User Services Working Group members, DAAC personnel, etc. These evaluators will not be regulated, tasked, advised in how to proceed through the system, nor will their sessions be timed. Data collected from these evaluators will be strictly in the form of written comments and survey responses as recorded in the CST.

Evaluation Period will start on November 20, 1995 and continue to January 31, 1996. Usability testing will be completed within this time frame. Independent Evaluators will be asked to access EP6 at least twice during this period.

3.2 Lessons Learned From Previous Evaluations

Usability testing and the CST, then known as the Interactive Evaluation Tool (IET), were both used for evaluation of EP3 and EP4, the most recent in the series of Evaluation Prototypes. Both methods were effective in providing valuable data to developers. The lessons learned through use of these evaluation methods, as well as the experiences gained during the evaluation of Prototype Workshop 1 (PW1) have been incorporated into evaluation of EP6. Many of the lessons learned are not relevant to discussion at this point in the document but for illustrative purposes two examples are given.

- During the usability testing of EP4 it was learned that the use of two Participants during a usability test session was a success. When two Participants work together to complete the usability tasks the session flows more smoothly. Teaming Participants up helps to lower Participant anxiety, increase their confidence and improves interaction among the Facilitator and Participants. It is more difficult to schedule two Participants for usability test sessions but it is worthwhile.

- Although the EP4 Evaluation Plan stated that a Demonstration Script created using a capture/playback tool would be used to demonstrate EP4 to the Participants it was not used. Due to technical problems it could not be used. Instead, the Facilitator gave an EP4 demonstration, following the Demonstration Script as closely as possible, to the Participants of each session. During the demonstration the Participants were able to ask questions, investigate other EP4 features not included in the demonstration (or the usability test), and in effect, tailor the demonstration to their own interests.

4. Usability Testing

4.1 Test Methodology

Usability testing is a method of quantifying the ease with which a system can be used. It has been utilized to capture various measures such as user satisfaction, access time, and error rates. These are all used to locate areas of the system in need of improvement. The methodology employed for usability testing of EP6 is adapted from a paper written by Martha Szczur, "Usability Testing on a Budget." Szczur describes an efficient and low cost method of testing and quantifying usability. This methodology has been employed for the evaluation of EP3 and EP4.

A five step process will be used to design the usability test and carry out the test series on EP6. Before usability testing can begin the goals of the testing and method of measuring them were identified, section 4.2. Following this, task areas were analyzed and specific user tasks clarified, section 4.6. Third, the sample test participant pool was defined and targeted, section 4.3. Once the usability test packet is completed it will be tested as part of a validation process to locate any areas where the test does not flow logically, is unclear, or is unduly lengthy. This step helps to determine where the usability test participants may become confused, lost, or frustrated. The final step will be to administer the test to the usability test participants.

4.2 Test Goals

EP6 will be released for user evaluation from November 20, 1995 through January 31, 1996. The usability testing goals for EP6 include:

1. Quantify relative ease of use of tested EP6 functions.
2. Identify whether or not tested EP6 functions are intuitive to perform.
3. Identify, quantify, and prioritize functions or features of EP6 that could benefit from improvement. This goal includes:
 - evaluate the Human-computer interface (HCI) designs.
 - evaluate the data search, identification, and selection features.
 - evaluate the data organization features.
 - evaluate the data viewing features.
 - evaluate the HTML/WWW related features
 - evaluate the user customization features
4. Provide alternative solutions to improve these features.
5. Determine relative best times and worst times for access and use of EP6.
6. Determine the amount of time it takes to learn how to use each EP6 function.

7. Calculate user satisfaction for each task, user group, and the EP6 as a whole.
8. Provide feedback to developers.

4.3 Test Participants

Care must be taken in the selection of Test Participants; they must be familiar with the context within which the system will be used. Participants will be guaranteed anonymity and encouraged to comment on any and all aspects of the system, its design, and implementation.

A number of researchers and scientists have volunteered to become usability test participants. Participants will be divided into user classes depending upon their level of expertise: Novice and Expert. The Expert class will consist of those who are familiar with the system and were involved in the design and construction of EP6. The Novice class will contain those who are unfamiliar with EP6 or who have used it on a very limited basis. In order to determine the category into which each Participant falls, they will be asked to answer a few questions regarding their computer experience.

In addition to the test Participants, other personnel are involved in each usability test session. Each test session will include at least two Observers. Their responsibilities include taking notes of Participant reaction, comments, and body language. A Facilitator will conduct the usability test, act as host to the test Participants, and keep time for the test session. The Facilitator will keep notes and coordinate with the Observers to run a smooth and efficient test session. The records kept by the Observers and the Facilitator will be combined with task times, and user survey results for analysis.

4.4 Test Schedule

Each usability test session will be allocated a minimum of two hours. This will give the EP6 Facilitator and Observers time to set up for the session and introduce the Participants to the Observers, to the usability testing environment, and inform them of the test schedule. After introductions are completed, Participants will be given a short demonstration of EP6 showing each of the capabilities, and how to access them. This demonstration is discussed further in section 6.1. Participants will be given a chance to ask any questions before beginning the usability test, then the test will begin.

After the usability tasks are completed the users will take the on-line survey using the CST and be able to register their comments in the free-text field provided at the bottom of each CST window. At the conclusion of the test, Participants will be presented with their choice of a candy treat as a thank you for participating in the usability test. Once the Participants have left, the Facilitator and Observers will debrief and then transcribe their notes from the session.

4.5 Test Environment

Usability tests should be conducted in a quiet area free from noise, movement of people and goods, and other distractions. It is preferred that tests be conducted in a room allocated for that purpose, or in an area of a larger room that has been restricted to those participating in the EP6

Evaluation. There should be room enough for two test Participants seated side by side at the computer, a Facilitator sitting next to them, and two Observers located behind the test Participants. The environment should allow for sufficient Participant elbow room and an area for the Facilitator note taking. See figure below for test environment.

Although usability tests are usually conducted using one Participant at a time, it is not uncommon for two Participants to evaluate a system simultaneously. Usability test sessions for EP4 often included Participants working in pairs, this was found to be very successful. This arrangement allows for increased interaction between the Participants and an increase the number and detail of comments generated by the Participants. Another advantage of conducting tests using Participant pairs is that they can help each other navigate the system and learn how to use various features, rather than turning to the Facilitator each time they become "stuck." This will help to keep the usability test running smoothly and maintain Participant interest.

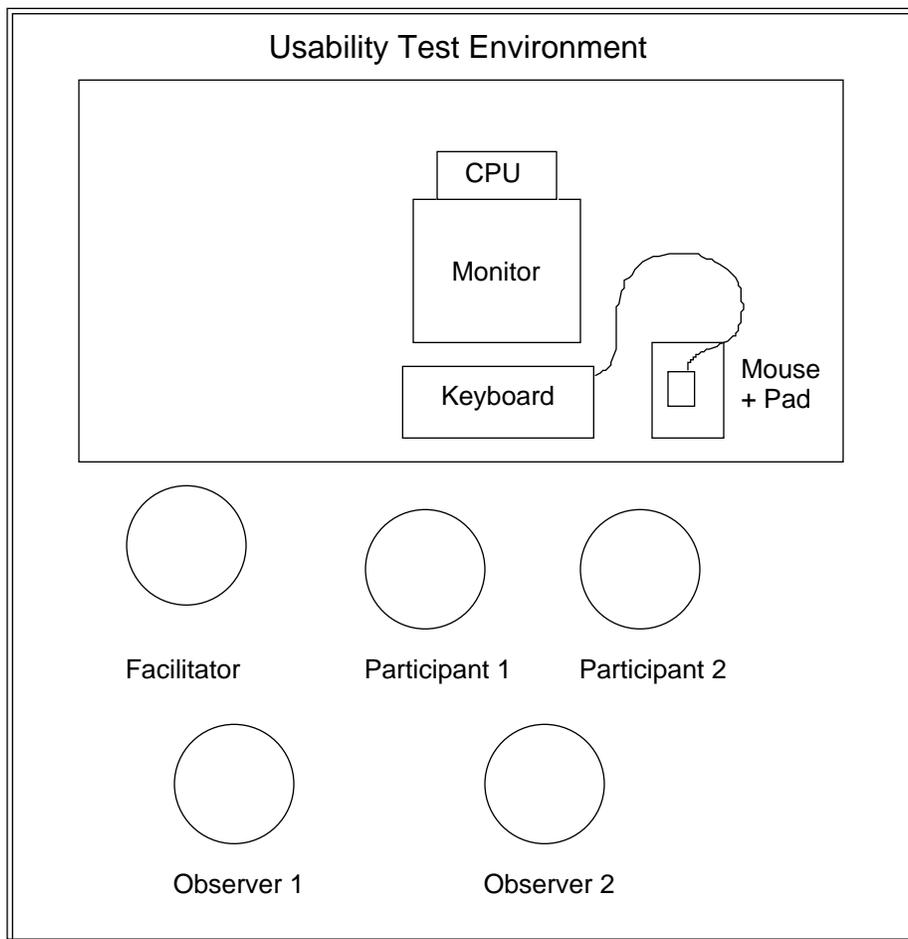


Figure 4-1. Usability Test Environment

4.6 Test Tasks

The EP6 developers and others involved with EP6 development provided a suggested list of tasks that they would like the users to execute. These tasks will be incorporated into a usability test packet draft and reviewed, as were the CST survey questions, to determine if they and the test packet are suitable. By suitable, the tasks:

- should flow from one task to the next in logical order.
- should allow the users to access and evaluate the significant portions of EP6, especially those portions of EP6 that developers highlighted specifically for evaluation.
- should be combined in a task packet so as to vary the difficulty from one task to the next. This will help to keep user interest focused on the test and reduce participant frustration.
- once combined in a test packet, should not take more than one hour to complete.
- should complement and coordinate with the CST survey questions.

Below is the suggested list of EP6 usability test tasks. This is a preliminary arrangement and is not complete, nor has it been evaluated to conform to the criteria listed above.

1. Launch/Log-on to EP6.
2. Confirm/Modify user preferences using the User Preference Tool
3. From the Desktop/Workbench, access the Earth Science Search Tool (ESST).
4. Search for data using the ESST and access the Data Dictionary to get definitions of search criteria.
 - select criteria using the attribute icon bar
 - Select temporal range of search using Timeline Tool
 - Select spatial coverage of search using Map Tool
 - Modify user preferences for WWW browser if necessary
5. Submit an order for the browse imagery corresponding to the data returned in the search
6. Retrieve the browse image and examine the image in EOSView.
 - Select different color tables
 - Pan and zoom image.
7. Move browse image into a new directory
8. Begin another search using ESST, change the icon attribute tool and save user preferences.
9. Search for data using the ESST
 - select criteria using the attribute icon bar
 - Select temporal range of search using Timeline Tool

- Select spatial coverage of search using Map Tool
 - Access the Data Dictionary to get definitions for search criteria
10. Submit an order for the data returned in the search
 11. Exercise the ftp data push/pull to retrieve data
 12. Access the Trouble Ticketing Tool
 13. Access the Comment Survey Tool and complete the on-line user survey.

4.7 Coordination with Comment Survey Tool

Once usability testing is complete, the results of the Comment Survey Tool comments and survey scores will be compared. Comparing the results of the usability tests with the results gathered from the larger group of Independent EP6 Evaluators will allow for in-depth analysis of user preferences, user satisfaction, user needs and if they were met by EP6. It is expected that both usability test Participants and Independent Evaluators will have similar experiences and comments about the EP6. However, it is likely that the Independent Evaluators will have more comments regarding EP6 help, access, and system performance, than the Participants in usability testing. In addition, the Independent Evaluators will be able to log on to EP6 and leave their comments in the CST a number of times during the course of the evaluation period. It will be interesting to monitor how, or if their comments change as a result of becoming more familiar with the EP6. Usability testing results will provide information on length of time to complete certain tasks, and will allow developers to see exactly how Participants use the system, rather than guessing how EP6 will be used.

The CST has been developed in close cooperation with those responsible for usability testing. This is to ensure that the questions asked in the CST reflect the experience of the usability test Participants and Independent Evaluators.

In order to make the coordinated data analysis more efficient a data storage and analysis plan will be devised prior to the Evaluation Period. For example, information such as statistics to be collected, graphics to be produced, level of detail to attain, etc. will be identified, this will save time and energy during the data collection process and also during data analysis. The data analysis of the Usability Testing, the Independent Evaluators results, and the comparison between the two will each be summarized in a chapter of the EP6 Evaluation Results Report, to be published at the end of February 1996.

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5. Comment Survey Tool

5.1 Survey Methodology

The Comment Survey Tool (CST) is an on-line survey that EP6 users will be able access during the course of their evaluation. It contains a series of questions relating to specific functions of EP6, as well as a few general questions on system as a whole. In addition, a field is available at the bottom of each CST window for users to enter their comments in free-text form. Users can use this comment window to expand on their answers to the survey questions and comment on the features and capabilities of EP6 that they liked and disliked.

Figure 5-1 shows the questionnaire development process. Reuse of survey questions used during previous EP and Prototype Workshop evaluations were given high priority for benchmarking purposes. Some EP3, EP4, and PW1 questions were used again in the EP6 CST survey to determine changes in customers' perceptions.

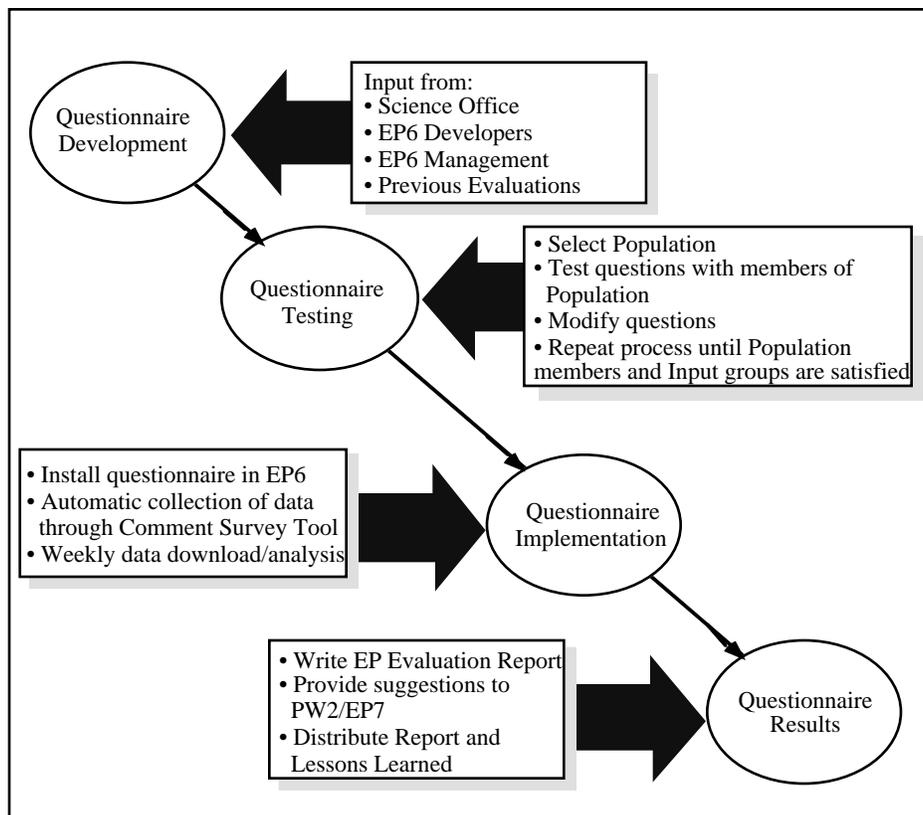


Figure 5-1. IET Survey Development and Implementation Process

To protect the integrity of the evaluation, several items relative to attribution of comments must be maintained. These are as follows:

- Each registered evaluator is given a unique user name and password. Comments and survey information are linked to the user who logged in.
- Non-registered evaluators may log-in using the “guest” account. Guest user comments will be evaluated and the survey data included. Guest user comments can not be attributed to a specific individual.
- To protect the integrity of the evaluation, when the comments and survey results are reported, individual’s names will not be linked to specific comments.
- Upon request, a listing of comments made by an evaluator will be provided but only to the evaluator. The evaluator is free to publish his or her comments.
- During the analysis of the survey data, groupings of comments or survey analysis may be used to determine group unique tendencies in the data. Examples of groups might be a specific DAAC or users services evaluators as a group.
- Summary of the results, indications for changes, and plans for implementing the changes will be presented in an EP4 Evaluation Results document.

5.2 Survey Goals

The goal of the on-line survey is to measure users’ perception of EP6 system, these will include user comments that will help to identify user needs and preferences. The user perception will give the ECS team ideas on future ECS design, functionality, and performance. The EP6 team will use the survey data to make changes to future ECS design and capabilities; therefore, meeting the users’ needs. This is the overall goal.

5.3 Survey Participants

Most of the survey participants evaluating EP6 will be science users. These Independent Evaluators will be experienced earth scientists with a wide range of computer and research experience. The evaluators will be drawn from a dispersed geographical area-. This sample population ensures our survey results are representative of a large portion of future ECS scientific users.

Each DAAC has expertise in different physical science applications and computer uses. The diversity in science applications should provide balanced feedback from the science community. In addition to those located at the DAACs, Evaluators will be accessing the EP6 from universities across the country.

There will be approximately 100 EP6 Independent Evaluators. They have been selected by DAAC managers, Version 0 representatives, and NASA personnel, among others using the criteria listed below:

- Tirekickers
- Science User Working Group members

- DAAC User Services Working group members
- V0 Development Team members
- Instrument Teams
- Interdisciplinary Investigation Teams
- Graduate Students in the Earth Sciences
- ECS Science Liaisons
- ECS System Engineering Liaisons
- DAAC M&O
- ECS M&O

Their knowledge base and independence are critical factors in evaluator selection. The evaluators' skills provide the EP6 team with additional expertise to refine the ECS design so that it meets customers' needs.

5.4 Survey Schedule

Each week the EP6 team will export the CST survey data from a centralized database. This database receives the CST survey results in real-time. There will be a once per week data collection process and data integrity check on the user survey data.

To download the information an EP6 team member will execute a procedure against the database and extract time-stamped CST survey data. The data collection and integrity check process will be tested in before the EP6 is open for evaluation. In November 1995, the EP6 team will begin extracting and analyzing survey data on a weekly basis. At the end of the Evaluation Period, the data will be compiled, analyzed with data collected through usability tests, and a report will be generated.

5.5 Survey Questions

The CST survey questions were grouped into eleven sections, each pertaining to a portion of the EP6. To ensure that the questions were readable and understandable, they were reviewed by ECS personnel who have backgrounds in science and technical areas similar to those who will be evaluating EP6, but who are not associated with EP6 evaluation. Their comments were incorporated in to the final version of the CST questions.

Users will be asked to base their answer on the amount with which they agree or disagree with each question. A Likert scale of 1 (Strongly Disagree) to 5 (Strongly Agree) will be used to quantify users' responses. A list of the CST survey questions are available in Appendix A.

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6. Demonstration Scripts

6.1 Overview Demonstration

Prior to conducting each usability test the Participants will be shown a brief demonstration of EP6. The Overview Demonstration script will contain basic information for the Participants to learn how to access and operate EP6 functions and locate resources. However, the script will not go in to great detail because that would bias the Participant's response and actions in the usability test. The Overview Demonstration will show Participants files on the EP6 Desktop/Workbench being manipulated, how to access and select search criteria in the ESST, how to access the Data Dictionary, download information from the Advertising Service, and access the Comment Survey Tool.

An outline of the Overview Demonstration is listed below:

- 1) Login to the EP6 and view the Desktop/Workbench
- 2) Describe Workbench, explain that you can re-organize it, show the help, etc.
- 3) Access the ESST and show features of the tool
- 4) Access the Data Dictionary to look up the definition of an Earth Science term
- 5) Search for information in the Advertising Service and install the resulting service/provider it on the Desktop/Workbench
- 6) Access the Comment Survey Tool
- 7) Return to the Desktop/Workbench

6.2 Evaluator Demonstration

Independent Evaluators will also have access to the demonstration script as posted on the Electronic Data Handling System (EDHS). The Evaluator Demonstration, however, will be longer and more detailed than the Overview Demonstration. Because the Independent Evaluators will not have access to an EP6 developer, usability test Facilitator, or EP6 Help Desk Personnel at their elbow, a more detailed demonstration script of EP6 is necessary. Just as usability test Participants will be given a context, or scenario within which to evaluate EP6, the Evaluator Demonstration script will be written with a similar context or scenario in mind so they may have a context within which to evaluate EP4.

The Evaluator Demonstration script will contain information on where various features are located in EP6, how to access them, and some of their more detailed capabilities. For the most part it will follow the outline of the Overview Demonstration script but in much more detail. The Overview script will be provided in "actions and associated results" format, with occasional material added to further clarify actions/results. The Evaluator Demonstration script is designed for individuals to follow on their own.

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7. References

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Appendix A

Comment Survey Tool Questions:

All of the questions should be answered using a scale of 1 (strongly disagree) to 5 (strongly agree), a score of 3 represents a neutral or no opinion.

User Registration

- It was easy to complete the application for an ECS account.
- I like being able to register for an ECS account through the World Wide Web.
- The information I was asked to provide in the application was appropriate.
- The account application should request ONLY mandatory information, rather than a complete set of address and contact information.
- Delivery of my account password via US Mail is acceptable.
- The User Registration Help documentation was informative.
- I like the layout of the User Registration page.

Advertising Service

- Navigation through the Advertising Service was easy.
- It was easy to search for advertisements using the Alphabetical Index.
- It was easy to construct a search for advertisements using the General Search Form.
- A choice of multiple methods for locating services and related data is useful.
- The ability to search for advertisements on the World Wide Web is an important aspect of the Advertising Service
- It was easy to construct a query using the Attribute Search tool.
- I found the Attribute Search tool useful.
- The Advertisements available in the Service contained the appropriate information.
- It was easy to install advertised data products and services on the Workbench.
- It was easy to submit an advertisement to the Advertising Service.
- The Advertising Service Help documentation was informative.
- The Advertising Service was easy to use.

EOSView

- The EOSView HDF file window displays the file's structure clearly.
- Panning and zooming on images in EOSView was easy.
- The ability to select different color palettes for the image display was useful.
- The EOSView animation capability was useful.
- The speed of the EOSView animation was appropriate.
- The EOSView window layouts are easy to understand.

- The functionality (display of data values, animation, zooming, etc.) provided in EOSView is adequate for my needs/uses.
- Help information/instructions provided for EOSView are understandable.
- Overall, I found EOSView easy to use.

Data Dictionary

- Searching through the Data Dictionary was easy.
- The ability to search through the Data Dictionary for information about data collections, instruments, parameters, and acronyms is important.
- It was easy to find items of interest using the Index.
- I like the way the Index is organized.
- Finding items of interest using the Search Form was easy.
- Defining queries using the Search Options on the Full Search Form was easy.
- When I submitted my search queries I received the results I had expected.
- The information contained in the Data Dictionary is the type of information I expected.
- The layout of the Data Dictionary was easy to read.
- The Data Dictionary Help documentation was informative.
- The Data Dictionary was easy to use.

Desktop/Workbench

- It was easy to invoke/access EP6 applications from the Workbench.
- The pull-down menus were logically organized.
- It was easy to create new directories and move files around the Workbench to suit my needs.
- The Workbench layout was easy to understand.

Earth Science Search Tool (ESST)

- I like the layout of the ESST.
- It was easy to construct a data query using the ESST.
- It was easy to select geographic coordinates using the map tool.
- I like the way the timeline is implemented.
- The Results window was easy to understand.
- I like the way the data was organized in the Results window.
- It was easy to modify the toolbars to customize the ESST.
- It was easy to download a browse image.
- I like the linkage between the ESST and EOSView for viewing browse images.
- I like the linkage between the ESST and the Advertising Service for searching for data and information.
- It was easy to select data collections to order.
- The ESST Help documentation was informative.

Product Request Tool

- The Product Request Tool window was easy to understand.
- It was easy to request products using the tool.
- I liked being able to access the Product Request Tool directly from the Desktop.
- The Product Request Tool Help documentation was informative.

Trouble Ticketing

- It was easy to submit a trouble ticket.
- The layout of the Trouble Ticketing tool was easy to understand.
- It was easy to obtain the current status of my trouble tickets.
- The information requested when submitting a trouble ticket was sufficient to accurately describe the problem.
- The Trouble Ticketing Help documentation was informative.

User Preference Tool

- I like the layout of the User Preference Tool.
- It was easy to modify user preferences.
- The User Preference Tool Help documentation was informative.

User Profile Tool

- It was easy to use the User Profile Tool.
- It was easy to modify user information in the User Profile Tool.
- Help provided for the User Profile Tool was informative.

General

- Navigation through EP6 was easy.
- The EP6 window layouts are easy to understand.
- I like the way the EP6 Help function is implemented.
- The Help provided in EP6 was adequate for my needs.
- The Help provided in EP6 was easy to understand.
- It was easy to fill out the user survey.
- The layout of the survey was clear and easy to use.
- My experience using EP6 was positive.

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