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The purpose of this study is to understand usability of the web interface of the Lifetime Library, a shared storage system provided by the School of Information and Library Science at the University of North Carolina at Chapel Hill. Eight participants were recruited and were asked to perform a number of file management tasks, such as uploading a file, renaming a file, creating a folder, adding a tag, adding metadata, organizing a folder, and deleting a file, by using the Lifetime Library web interface. Task completion rate, task completion time, perceived difficulty, confidence in completion of task, number of clicks, and comments were collected to understand each task's usability. Participants' responses were measured using the System Usability Scale, and written comments were gathered to understand overall usability of the system. From the results, it was found that bulk uploading was the most difficult task for all participants. It was also found that the longer a task takes time to complete, the higher the tendency to perceive the task as difficult. The results of the study suggested areas for improvement in the usability of the current system, such as placement of menu items, consistency between the main menu and the side bar menu, clear right-click menu, and visibility of notification messages.

Headings:

Cloud Storage

File Organization

Graphical User Interfaces(Computer Systems)

User Interfaces

Usability Engineering(System Design)

USABILITY STUDY OF BASIC FILE MANAGEMENT ON A SHARED STORAGE
SYSTEM: USABILITY TEST ON THE LIFETIME LIBRARY WEB INTERFACE

by
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Approved by

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1 Introduction

1.1 Lifetime Library

The Lifetime Library is a service provided by the School of Information and Library Science (SILS) at the University of North Carolina at Chapel Hill (UNC-CH), aimed at providing a permanent shared storage system for students and alums. Students with access to the Lifetime Library are able to upload, store, and manage all of their digital information, including class materials, photos, music, etc. The Lifetime Library provides a digital space for students to develop their own personal digital collection that they can access forever.

The purpose of this study is to conduct a usability test on the Lifetime Library to find suggestions for further development of the user interface. Currently, the Lifetime Library is in a phase of continuous development and updates, and is only providing beta service to SILS students (as of 2013). However, the Lifetime Library envisions expanding the service to more UNC students in the future. For this reason, there is a need to diagnose and improve the current interface in order to deliver a better user experience. Additionally, results from this study may suggest design implications for designers and developers of shared storage systems, as there are not many published studies investigating basic use scenarios of file management systems.

There are three ways to access and manage files on the Lifetime Library: via web client, desktop client, or command prompt. Among three available interfaces of the Lifetime Library, this usability test will be conducted on the web interface only, given

limited time and resources. Based on the given background and knowledge of the Lifetime Library, the main research question addressed in this work is to understand if the web interface of the Lifetime Library is providing a satisfactory file management experience to its users.

2 Literature Review

2.1 Usability test

In general, the term “usability” refers to how user-friendly and easy-to-use an interface is. The abstract concept of usability can be explained by defining its number of elements. Usability expert Jakob Nielsen (2010) stated that the term “usability” is defined by five components: learnability, efficiency, memorability, errors, and satisfaction. According to this definition, a good interface provides easy way for novice users to accomplish their tasks (learnability), enables users to quickly and efficiently perform tasks (efficiency), is memorable so that returning users can re-establish proficiency (memorability), is error-free (errors), and delivers pleasant experience to its users (satisfaction).

On the other hand, the International Organization for Standardization (ISO) defines usability with only three aspects in its standard ISO 9241 Part 11: effectiveness, efficiency, and satisfaction. Effectiveness is whether a system can support a user to complete a task. Efficiency is the amount of effort and resources to be exerted by a user to complete a task. Satisfaction is about users’ fulfilled experience. In sum, usability is a matter of enabling users to accomplish their task efficiently, as well as creating a positive subjective experience, which allows them to use the system easily again in the future.

There are a number of strategies to test usability of a system. Existing usability test methods can be generally grouped into two categories: one method is conducted by

experts with thorough knowledge in the field of usability, and the other involves having real users of a system test the product.

The first method, conducted by experts, can be divided into two categories as well: heuristic evaluation and cognitive walkthrough. Heuristic evaluation is having one or more experts look at an interface in an informal way to find usability issues using a holistic view (Nielson, 1990). Cognitive walkthrough is another way for experts to investigate a usability of an interface. Whereas heuristic evaluation takes a holistic view, cognitive walkthrough is more task-specific, thorough, and detail-oriented. Experts approach the matter of usability by firstly defining tasks and action sequences that are necessary to accomplish each task. Once the task analysis is done, a number of experts “walk through” an interface with a set of questions such as: 1) if users will try to produce the effect the action has; 2) if users will notice the control for the correct action is available/visible; 3) if users will recognize the link between the control and the desired effect; and 4) if users will get the feedback that they have done the right thing (Wharton et al., 1994).

Another strategy to measure usability is having real users engage in a usability test. Users are given a working prototype, and are asked to perform a number of tasks. Tasks and optimal action sequences may be defined prior to the test. While users perform the tasks, researchers record various values that may represent effectiveness and efficiency of the system, such as speed, completion rate, and errors (Rubin & Chisnell, 2008). The measurement can be adjusted depending on devices being used during a test. For example, if an iPhone interface is being used for a usability test, a number of taps can be measured to demonstrate efficiency of the interface (Lauterbach et al., 2011).

According to Nielsen's findings in 1993, 15 users are needed in order to find all usability issues of a system. However, findings from Nielsen's research show that aggregates of evaluators reach the point where the number of new usability issues found diminishes around ten evaluators. For this reason, in a real world where a design process is iterative under a limited budget and resource, normally five subjects are considered to be sufficient to find major usability issues. Nielsen suggests conducting usability tests with five subjects iteratively, instead of testing only one time with fifteen subjects (Nielsen, 1993).

In addition to measuring quantitative values that represent efficiency and effectiveness of a system, qualitative information can be also gathered from subjects to understand their subjective opinions and experience. One method frequently used by usability evaluators is a "think-aloud" protocol, which allows subjects to speak out loud what goes in their mind as they go through each task (Fonteyn, Kuipers, & Grobe, 1993). Researchers record and gather the verbal information from the test participants, and use the information for a rich understanding of the system usability.

Researchers in the field of usability have also developed a number of user satisfaction scales to understand participants' overall experience on a system. One of the most frequently used scales is the System Usability Scale (SUS), developed by John Brooke in 1996. The scale consists of 10 questions, and was developed in order to allow usability researchers to conduct a "quick and dirty" usability test with low-cost, with reliable 5-points Likert scale (Brooke, 1996). SUS measures the usability of a system in three aspects: effectiveness, efficiency, and satisfaction. Because of its cost effectiveness, and its ability to provide global assessments of a system usability, it is widely used by

usability researchers. Due to its simplicity and high-level subjective view of usability, this study chose to use the SUS to understand participants' overall user experience with the Lifetime Library.

Another scale, the questionnaire for User Interface Satisfaction (QUIS), is a survey consisting of 9-point scale 27 questions to assess users' subjective satisfaction. The QUIS 7.0 is its most current version as of 2012, and is more in-depth scale compared to the SUS. It measures interface in nine factors: screen factors, terminology and system feedback, learning factors, system capabilities, technical manuals, online tutorials, multimedia, teleconferencing, and software installation. Researchers can configure the survey in accordance with their interest of each interface analysis (Chien et al., 1988).

Computer Usability Satisfaction Questionnaires (CSUQ) is a questionnaire developed to measure usability, with a focus on real use cases. Compared to other usability satisfaction questionnaires, the CSUQ is recommended to be used in a real field testing situation, instead of a lab-based usability test setting. It is because the wording of the question items are modified not referring to the lab-based usability testing setting. The CSUQ is made up of 19 questions in 7-point scale. The CSUQ measures a system's ease of use, ease of learning, simplicity, effectiveness, information, and the user interface (Lewis, 1995).

2.2 Usability studies on a shared storage system

There has been a growing body of research demonstrating users' needs and usability with managing files in a shared storage system. These researches emphasize understanding users' mental models in order to develop an interface with increased usability. A study by David and Pierce (2008) recognizes that people want to access their

information saved in one device with different devices, as the usage of multiple computing devices by users in their daily lives increases. In addition, they suggested focusing on users and their activities, not merely on devices, when designing a storage system across several devices in order for the improved usability.

Some interface design implications to provide mental scaffolding were also suggested by Marshall and Tang (2012), based on understanding users and their activities on a cloud-based storage such as Dropbox, Google Docs and iCloud. They constructed a conceptual framework for the three cloud storage services by defining use cases and user actions in accordance with five pivotal concepts: personal file repository, shared file repository, personal replicated file store, shared replicated file storage, and the synchronization mechanism that coordinates among replicas.

Whalen et al. (2008) approach a security and privacy problem in file sharing systems from the perspective of interface design. They state that users tend to think they know what files they have been, or are sharing within a computer-supported collaborative environment, but they actually lack file-sharing awareness, such as file access permissions, or the history of a file. As an attempt to solve this problem, the authors came up with labels and icons to visibly represent a history, as well as the current statuses of users' file sharing activity.

The common aspect of the three studies reviewed above is that they examine users' mental models and their use scenarios in order to come up with design implications for file management in a shared storage system. However, they tend to focus on advanced features of a shared storage system, such as integration of multiple devices and privacy settings, presumably based on the assumption that the storage system is already in service

and fully functional. The Lifetime Library service is still in beta, and is in a phase of continuous development of its system and interface. For this reason, this paper aims to prove usability of the Lifetime Library based on users' basic use scenarios for the purpose of suggesting better design ideas for the Lifetime Library, and possibly obtaining generalized design implication for designers/developers starting a development of a shared storage system in the initial phase.

3 Methodology

3.1 Definition

As mentioned in the Introduction section, the main research question of this study is to understand if the Lifetime Library web interface provides a satisfactory file management experience to its users.

In order to answer the research question, two abstract concepts need to be defined. First of all, the definition of “satisfactory experience” will be represented by usability. As already discussed in the literature review section, the term “usability” means effectiveness and efficiency of a system along with users’ subjective satisfaction. Measurements and scales to measure the usability will be discussed in the “Measurement” section followed by the “Sample” section.

Secondly, “file management” will be defined by several use cases. The use cases of file management are: 1) upload a file, 2) upload multiple files at once, 3) change file/folder name, 4) add a tag, 5) add metadata, 6) create a new folder, 7) organize a file/folder (moving one file/folder from one place to another), 8) delete a file, and 9) delete multiple files at once.

In sum, this usability test will test users’ performance on the nine file management tasks and record related values in order to understand the system usability. Further details will be discussed in the following sections.

3.2 Sample and recruitment

Eight participants were recruited for this usability test via a listserv of the School of Information and Library Science (SILS) at UNC, targeting undergraduate and graduate students in the department. The number of participants was decided based on Nielsen's findings that five subjects are sufficient to find major usability issues of a system, and 15 subjects would find all usability issues, in theory (Nielsen et al., 1993).

There were a number of requirements to be a participant of this study:

1. *A participant should be over 18 years old.*
2. *A participant should be an undergraduate or graduate student at SILS.*
3. *A participant should be familiar with basic computing skills that are generally expected from university students.*
4. *A participant should be familiar with the idea of shared file storage systems such as Dropbox and Google Drive, but should be new to the Lifetime Library system. This is to avoid people who are already proficient with the system who may not be able to detect usability problems.*

3.3 Measurement

The use of the Lifetime Library is voluntary. In other words, using the Lifetime Library is not mandatory such as paying monthly bills. Therefore, efficiency and effectiveness are both important in order to draw more users to the system. For this reason, several variables to prove the efficiency of the system were measured in addition to measuring effectiveness of the system. Participants' subjective response was also measured by conducting a Web survey. During the test, the following was measured:

1. *Task completion rate (effectiveness)*: This was to see if a participant was able to successfully complete each task. If a participant could not complete a task in four minutes, it was considered a failure. If a participant gave up on a task voluntarily, it was also considered a task completion failure. Participants were instructed to raise their hand to inform the experimenter and give up, or stop the task.
2. *Task completion time (efficiency)*: This was to see how long it took for a participant to complete each task. Task completion time was measured from the time the experimenter indicated a participant to start each task to the moment that each task was done.
3. *Number of clicks (efficiency)*: This measured how many times a participant clicked a mouse button in order to complete each task. The number of clicks was recorded during each task completion time. This will be compared with the number of clicks for the optimal path to help understand if the optimal path is easy for participants to see and use.
4. *Perceived difficulty*: After each task, participants were asked to rate the perceived task difficulty on a 5-point Likert scale (1=Very difficult, 5=Very easy) in order to understand their subjective experience with the system. Participants rated the difficulty of the task with a prompt: “please rate how difficult the task was.”
5. *Confidence in completion of task*: After each task, participants rated their confidence in completion of each task on a 5-point Likert scale (1=Not at all confident, 5=Very confident). This was to see if the system properly and clearly indicated the completion of the task. Participants were asked the question: “how confident are you that you completed this task successfully?”

6. *Comments for each task:* After each task, participants were asked to leave a comment about their ratings on the perceived difficulty and their confidence in completion of task. Two separate questions were asked after each task to receive participants' comments: "Can you elaborate more why you scored X for the perceived difficulty?" and "Did you have any problem while completing the task?"
7. *Satisfaction:* In order to understand participants' overall experience with the system, the SUS scale was given to participants after completing all tasks.
8. *Comments:* After completing all tasks, participants were asked to leave comments about two things that they liked and disliked for the system.

3.4 Device setup

The usability tests were conducted in the Interaction Design Lab located in the SILS building, where participants could not be disrupted during testing. One participant participated at a time, and one experimenter observed the participant's responses and overall test procedures.

Two computers were used during the study. One was a PC desktop for the participants to perform each task. A screen recording software, Camtasia, was installed and operated on the desktop computer to record the screen as participants performed tasks. Test files needed for participants to accomplish each task were prepared in advance and saved on the desktop folder prior to each session. Google's Chrome browser (version 25.0.1364.97 m) was used for all sessions.

A PC laptop computer was also placed next to the desktop computer. On the laptop computer, a Web survey (Qualtrics) window was opened to give directions on

tasks and online survey. The purpose of the laptop was only to provide directions and survey form, and it did not record any participants' performance.

3.5 Test procedure - overall procedure

The following protocol was used for all participants:

1. The participant was greeted on the first floor of the SILS Library.
2. The experimenter escorted the participant to the Interaction Design lab and seated her at the computer workstation.
3. The experimenter read a prepared script describing the purpose, procedure, and device setup of this study. The experimenter gave the participant an informed consent form to review and sign. The participant was then given time to ask any questions.
4. The experimenter presented a laptop computer displaying a brief introduction to the study that would give an overview of the task and scenario. The task scenario asked the participant to imagine that she is a user working on organizing their digital photos using the Lifetime Library. This was presented on the laptop screen and the participants were allowed to ask any questions.
5. The experimenter asked the participant to login to the Lifetime Library.
6. The experimenter told the participant to read the first task and task scenario provided on the laptop computer, and to start the task if she was ready. The participant was instructed to work as she normally would.
7. Next, the participant was asked to complete a set of questions about her experience. These questions were administered using a Qualtrics questionnaire.
8. The steps 6 and 7 were repeated to complete all tasks.

9. After completing all tasks, the participant provided comments about their experience in addition to System Usability Scale survey.

10. The participant received a token of appreciation, \$10.

3.6 Test procedure - observation guide

Along with the screen recording software and the electronic survey form, the experimenter sat in the same room with a participant in order to observe the participant and take notes about her actions with the system. The experimenter sat a few feet away from the participant to provide space.

During the task, if the participant asked questions about the interface or how to conduct specific tasks, the experimenter gave the standard response: “I’m sorry, but I cannot give you advice on how to do the task. Just do the best you can.” The participant had four minutes to work on each task. If the task was incomplete at the four minute mark, the experimenter counted it as a task completion fail and let the participant know they can stop the task and skip to the next one and fill out the post-task questions.

3.7 Test procedure - tasks and use case scenarios

Participants were given nine tasks managing files using the Lifetime Library. The sequence of tasks was fixed rather than rotating the order due to the nature of the tasks. For example, in order to delete a file, a file should be uploaded first. In order to move a file from one folder to another, a folder should be created first. For this reason, the order of tasks was fixed.

A use case scenario was provided along with each task in order to give participants contextual information and help them get more involved in each task as a real user of the system. The task descriptions and use case scenarios are as follows:

1) Upload a file

Overall scenario: You are a new user to the Lifetime Library, and you are about to organize your personal photos on the Lifetime Library web interface. On your desktop, you have a folder named “my photos” and the folder contains five photos.

Use case scenario and task: You want to store your photos on your Lifetime Library. As a first step, you would like to try uploading a single file to your Lifetime Library space. Upload “test.txt” saved on the desktop to your Lifetime Library.

2) Upload multiple files at once

Use case scenario and task: Now you want to upload the “my photos” folder. Upload the “my photos” folder to the top level of your Lifetime Library.

3) Change a file/folder name

Use case scenario and task: Now you have the “my photos” folder in your Lifetime Library space. However, you want to change the folder name to “travel photos.” Change the folder name to “travel photos.”

4) Add a tag

Use case scenario and task: You would like to manage your photos by adding tags to your photos. Add “tag1” to the “photo1” file.

5) Add metadata

Use case scenario and task: You would like to have your collection more organized by adding descriptive attributes to files. For example, you can specify where a photo was taken (*location*), when the photo was taken (*time*), who took the photo (*photographer*), etc. Add an attribute named “location” and set its value as “UNC-Chapel Hill” to “photo 2” in the “travel photos” folder.

6) Create a new folder

Use case scenario and task: You realize that some of your photos in the “travel photos” folder are not organized well. The photos are about animals, not traveling. You would like to create a new folder named “animal photos” and move the photos to the new folder. Create a new folder named “animal photos” on the same folder level (parallel) to the “travel photos” folder.

7) Organize a file/folder (moving one file/folder from one place to another)

Use case scenario and task: Now you want to move the animal photos to the “animal photos” folder. Move “photo 3” to the new “animal photos” folder.

8) Delete a file

Use case scenario and task: You realize that you don’t need the “test.txt” file anymore in your collection. Delete the file from the Lifetime Library.

9) Delete a number of files at once

Use case scenario and task: You realize that you have the same travel photos already stored somewhere on your Lifetime Library. The travel photos are redundant, so you want to delete them. Instead of deleting each file one by one, delete the four photos in the “travel photos” folder all at once, but keep the “travel photos” folder.

3.8 Lifetime Library Web interface

In this section, a number of important elements in the Lifetime Library Web interface that participants frequently used to complete tasks will be briefly introduced. Figure 1 is the first screen of the Lifetime Library Web interface that a user will see after logging into the system.

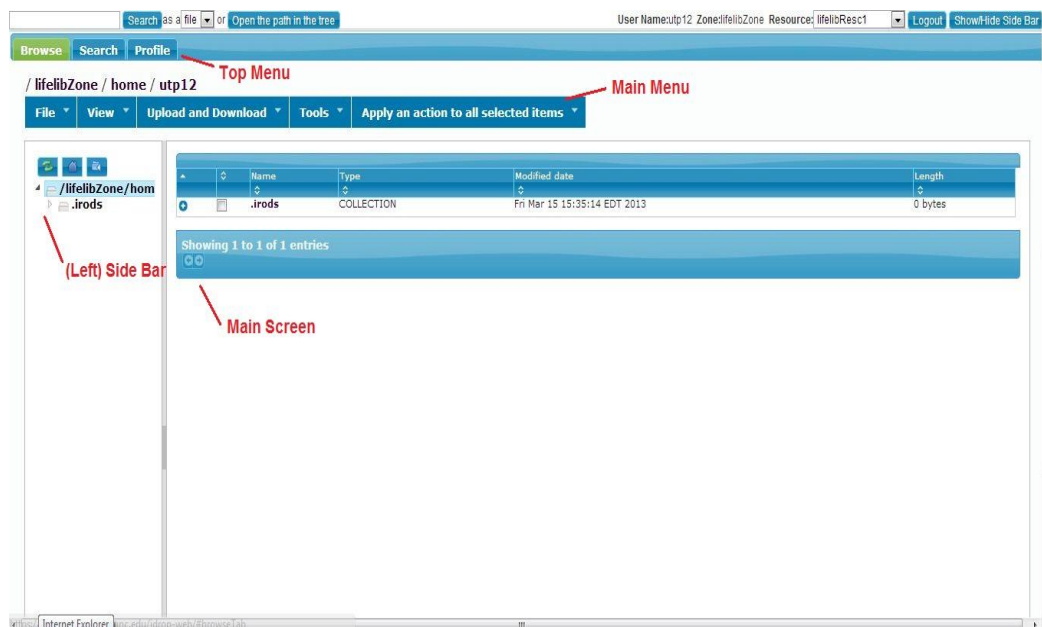


Figure 1. Lifetime Library Web Interface

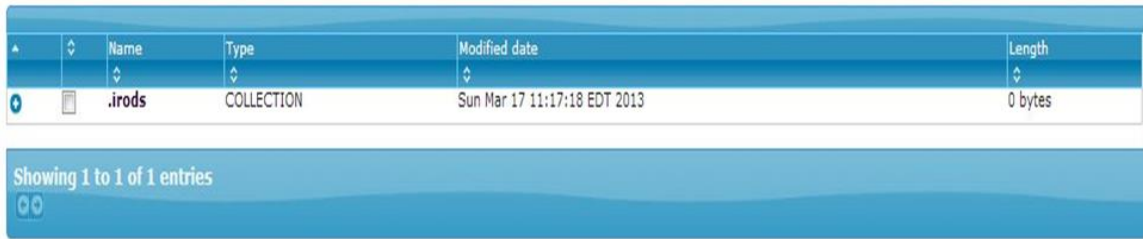
Firstly, the very top menu consisting of “Browse”, “Search”, and “Profile” will not be needed when participants perform tasks for the test. However, a couple of participants did click the top menu while completing some tasks.

Under the top menu, the main menu is where users can operate various functions in the system (See Appendix A for images of the main menu). Listed under the “File” menu are the options for “Refresh” and “New Folder”. A user can refresh the screen by clicking “Refresh”. Clicking “New Folder” will enable a user to create a folder in the user’s current location. Listed under “View” are “Browse”, “Info”, “Permissions”, “Metadata”, “Gallery”, “Audit”, and “Tickets”. Basically, submenus under “View” will


display information related to a selected file or folder. Using “Upload and Download”, users can “Upload”, “Bulk Upload”, or “Add to Cart”. “Upload” uploads a single file, and “Bulk Upload” uploads a number of files at once. “Add to Cart” is used to add a selected file to cart, so that she can download items in the cart at once. Under “Tools”, there is currently only one menu named “Create Public Link”. This enables a user to share a selected item with other users, but none of the tasks in this usability test use this feature. With the last menu, “Apply an action to all selected items”, a user can “add all selected items to the cart (to download)” or “delete all selected items”.

The left sidebar shows folders and files contributed by the user. It displays folders and files in a tree structure. By clicking a small triangle shape right in front of each folder name, users can open the folder tree and view files in the folder in the sidebar. By right-clicking the file or folder name on the left sidebar, users can “Refresh”, “Rename”, “Delete”, “New Folder”, “Info”, “Cut”, “Copy”, and “Paste”.

The main screen is where users can actually view detailed file information. Figure 2 is a closer look at the main screen section. On the very left, there is “+” icon. If a user clicks the button, the system will display detailed information about the file. By checking the checkbox located right next to the button, a user can perform various tasks on selected items such as deleting multiple files at once. The “Name” field shows the name of the file. The “Type” field shows the type of the file. In this image, “.irods” is a folder, so the type is a “COLLECTION”. If the file is a real file such as a photo, then the type will be called a “DATA_OBJECT”. The “Modified date” displays the last date that the file was modified by the user. The “Length field” shows the size of the file.



The screenshot displays a web interface with a table containing one entry. Below the table, a status bar indicates 'Showing 1 to 1 of 1 entries'.

	Name	Type	Modified date	Length
	.irods	COLLECTION	Sun Mar 17 11:17:18 EDT 2013	0 bytes

Showing 1 to 1 of 1 entries

Figure 2. Lifetime Library Web Interface - Main Screen

4 Results

4.1 Comparison and overview of all tasks

In this section, analysis and comparison of all tasks will be provided to understand the overall results of the study.

4.1.1 Task completion rate

Task completion measures how many participants successfully completed each task. As Figure 3 shows, all eight participants successfully uploaded a single file (Task 1), created a new folder (Task 6), and deleted a single file (Task 8). Seven out of eight participants were able to add a tag to a file (Task 4), move a file to another location (Task 7), and delete a number of files at once (Task 9). Two participants failed to rename a file (Task 3) and three participants failed to add metadata to a file (Task 5). The most difficult task was “Bulk Upload”, where users were asked to upload a number of files at once (Task 2). No participants successfully completed task 2.

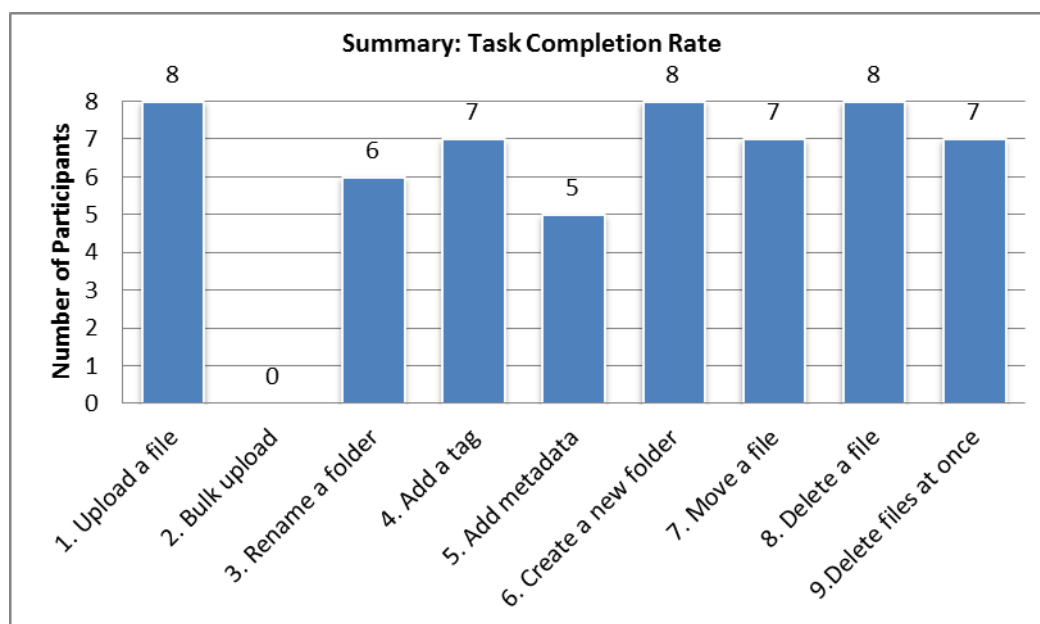


Figure 3. Summary of Task Completion Rate

Tasks 1, 6, and 8 with 100% task completion rate can all be completed using the top menu bar. Based on a detailed analysis on each task result described in the section 4.2., participants often used the top menu bar as a primary way to complete a task, and buttons to complete these tasks were easily found by the participants. One participant failed to complete Task 9 (deleting multiple files at once). There is a “delete all selected items” button on the top menu, so participants were able to complete the task easily, but one participant failed because he misunderstood the task. He understood that it is okay to delete files one by one, instead of deleting them all at once.

Tasks 3, 4, 5, and 7 each had two or three participants who were not able to complete them in the allotted time. Based on a detailed analysis described in section 4.2., a possible reason could be that there were no menu items for completing these tasks on the main menu bar. For Task 3 (rename a file) and 7 (move a file), a user must use the left sidebar menu and perform desktop-like actions, such as right-clicking a file name to rename, or dragging-and-dropping a file to move. However, as will be discussed in the

section 4.2., participants of this study usually started searching the top menu bar first in order to find the “rename” or “move” buttons. Because those buttons are not there, the participants had to come up with the idea of right-clicking or dragging-and-dropping. In the cases of Task 4 (add a tag) and 5 (add metadata), users had to navigate to a page that describes file information, but participants struggled to get to this page. The details of each task analysis will be further discussed in the section 4.2.

4.1.2 Task completion time

On average, it took 38.09 seconds for a participant to complete a task. Task 8, deleting a single file, was the fastest task for participants to complete (18.05 seconds). Next, Task 9 (delete a number of files at once) took 24.34 seconds. This result may indicate that participants became familiar with the use of the interface as they went through all the tasks during the test session. One participant commented on a survey that “Since I saw the delete function earlier, it was easy to figure out.” Another participant commented that “I just remembered from the last task.” These comments prove that there was a learning effect as participants went through the end of the test.

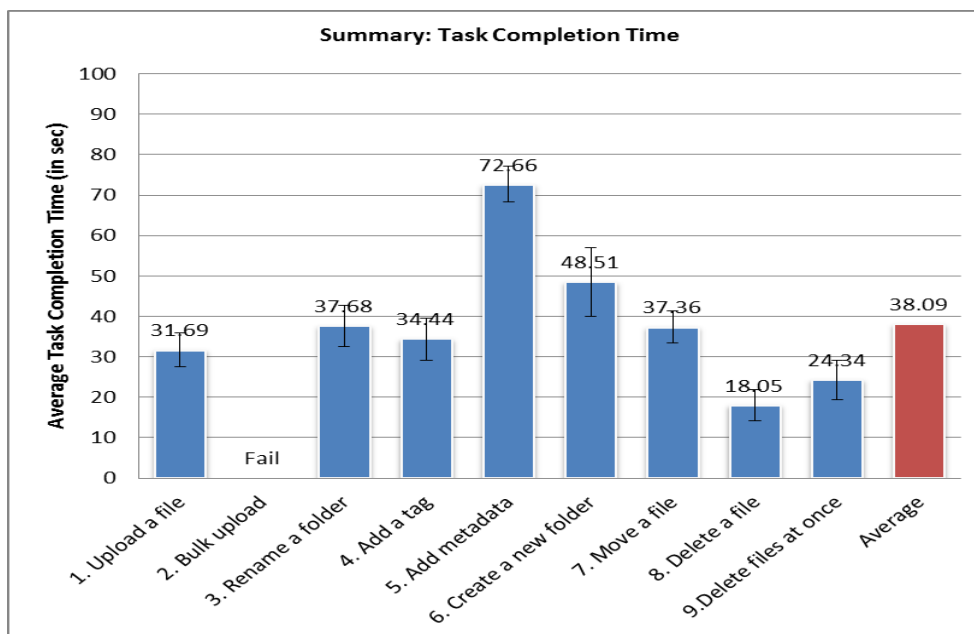


Figure 4. Summary of Task Completion Time with Standard Error

Task 1 (upload a single file, 31.69 seconds), Task 3 (rename a file, 37.68 seconds), Task 4 (add a tag, 34.44 seconds), and Task 7 (move a file, 37.36 seconds) took about 30 seconds to complete each task.

Creating a new folder (Task 6) took 48.51 seconds on average, with an outlier participant who took about 210 seconds to complete the task. If excluding the outlier, the average completion time of the Task 6 is about 25 seconds. This was faster than other tasks, because creating a new folder menu is available on the main menu bar.

Task 5 (add metadata) took the longest time to complete, 72.66 seconds. This can be explained by the fact that participants need time to type in metadata (“location” and “UNC-Chapel Hill”), and to get to the metadata field page.

4.1.3 Perceived difficulty

The average perceived difficulty of each task is as shown in the chart below (Figure 5). In the scale, 5 is “Very easy”, and 1 is “Very difficult”. In the overall

perspective, Task 2 (uploading multiple files at once) and Task 5 (add metadata) were scored below point 3 (perceived as difficult tasks).

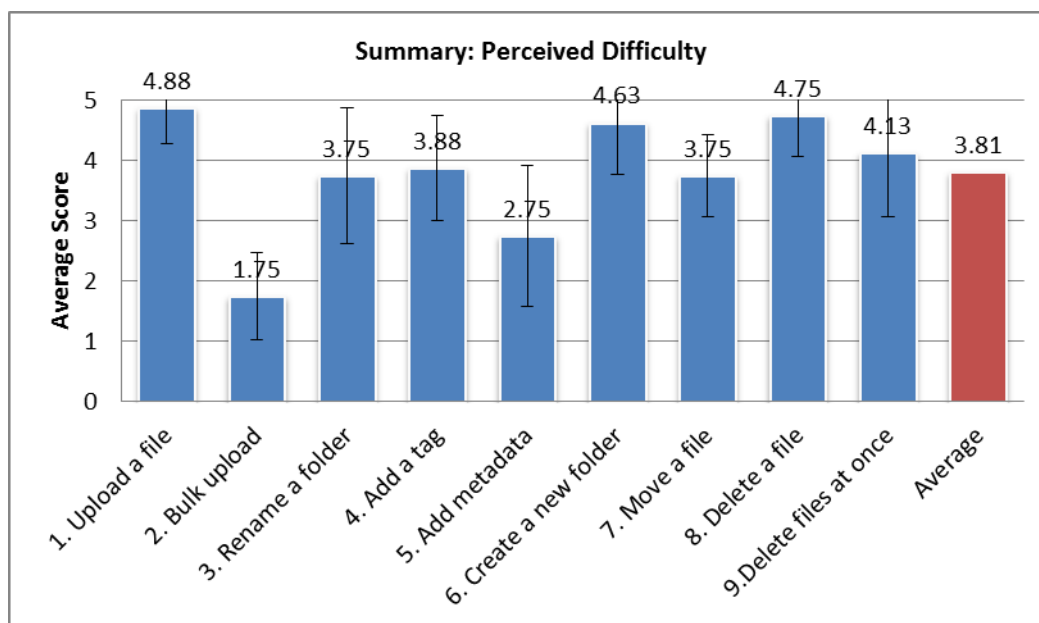


Figure 5. Summary of Perceived Difficulty with Standard Error

An interesting result can be found by comparing the perceived difficulty chart and the task completion time chart. In order to easily understand the correlation between the task completion time and the perceived difficulty, the scale of the perceived difficulty was inverted. The scale is inverted: 5 is “Very difficult” and 1 is “Very easy”.

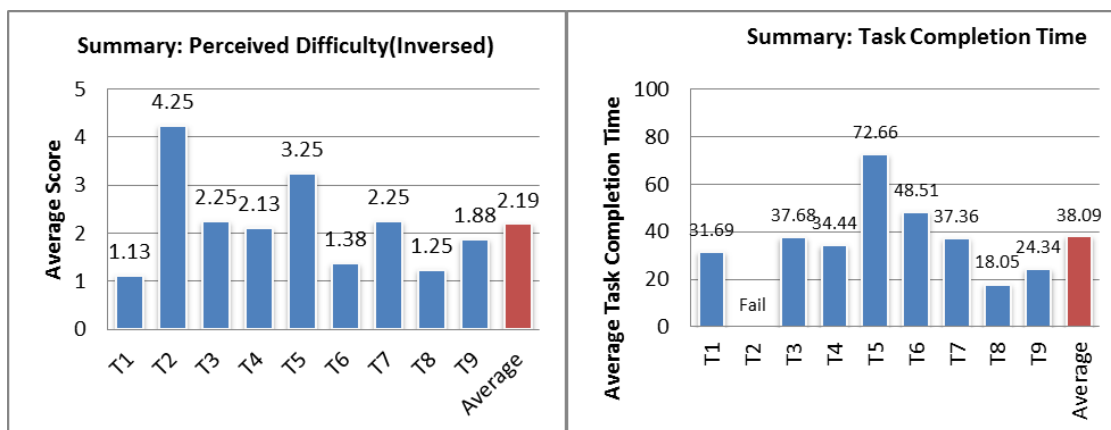


Figure 6. Comparison of Perceived Difficulty and Task Completion Time

As the two charts (Figure 6) show, the longer a task takes time to complete, the higher the tendency to perceive the task as difficult. For example, none of the participants completed Task 2 (uploading multiple files at once) and participants perceived this task as the most difficult one. Task 5, adding metadata, took 72.66 seconds and its perceived difficulty was the second most difficult. Additionally, except for Task 6 which had a significant outlier, the order of the tasks by perceived difficulty and the order of the tasks by the task completion time resemble each other. The order of tasks by perceived difficulty is 3, 7, 4, 9, 1, and 8. The order of tasks by task completion rate is also 3, 7, 4, 9, 1, and 8. This indicates that participants perceive tasks with longer completion time as more difficult than the others.

4.1.4 Confidence in completion of task

As opposed to the fact that the task completion time and the perceived difficulty had a correlation, confidence in completion of task is not necessarily associated with completion time or perceived difficulty. Confidence in the completion of task is more related to how well the system notifies or confirms a user that the system successfully executed a function. For instance, when participants failed to complete Task 2 by themselves, the experimenter gave instructions to them to observe their interactions with the system. As some participants completed the task with the experimenter's guidance, the system displayed a pop-up message "Transfer completed." Because of the pop-up message, the participants were able to know that the system completed the task successfully. Overall, participants had high confidence in completion of all tasks; the average score was 4.39 out of 5.

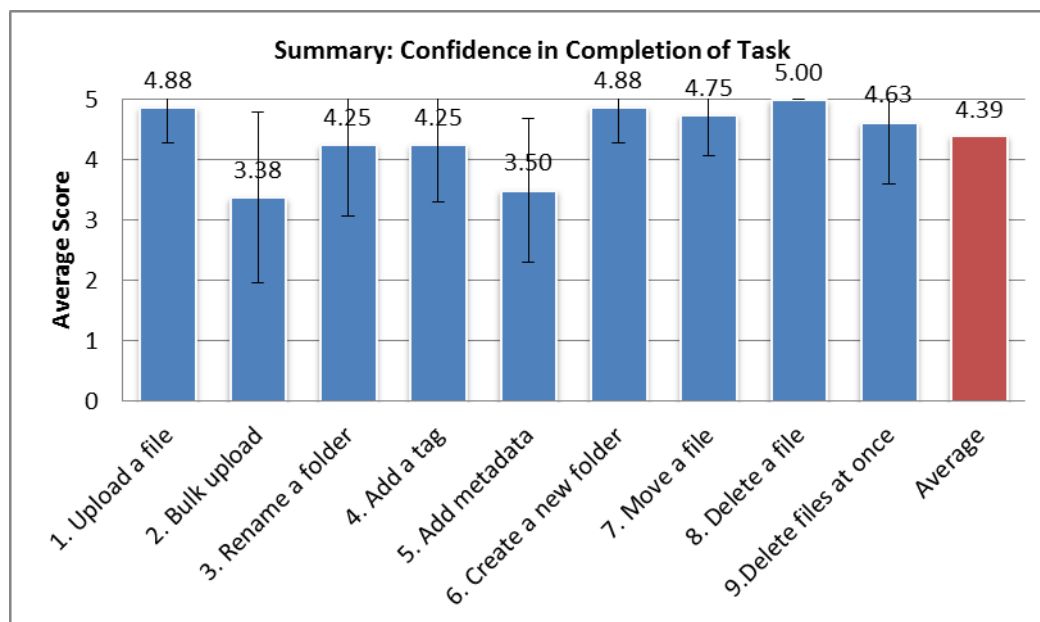


Figure 7. Summary of Confidence in Completion of Task with Standard Error

4.1.5 System usability scale

The System Usability Scale (Brooke, 1996) is a 5-point Likert scale measurement consisting of ten questions. SUS provides a general understanding on users' overall perceived experience with a system. The SUS questions were administered to the participants immediately after completing all the tasks.

Generally, a SUS score of 68 is considered an average score (Sauro, 2008). If a SUS score is over 68, it means the system's usability is above average. If the score is below 68, it means the system is below average. A percentile rank is also provided by Sauro (2008) through a process of normalizing the SUS scores he gathered from his 500 studies.

Figure 8 shows the SUS score from each participant, along with the average across all participants. The average SUS score of the Lifetime Library is 40. If normalized for the percentile rank, the score 40 is below 10% percentile rank. This

indicates that the Lifetime Library has plenty of room for improvement in terms of usability.

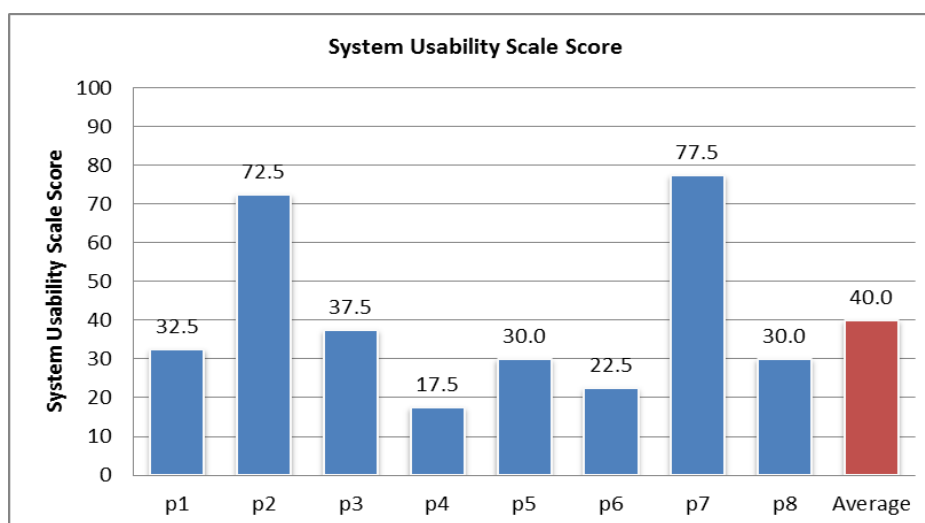


Figure 8. System Usability Scale Score

4.1.6 Two things liked and disliked

Along with the SUS score, participants were asked to freely provide written comments about what they liked and disliked about the system, two for each. Their comments were grouped into similar topics in order to better understand participants' overall opinion (Table 1).

Liked	Number of comments
Simple interface	4
Uploading a single file	2
Organizing a file by dragging	2
Color scheme	2
Menu on top (similarity with other systems/websites)	1
Free or charge	1
Right-clicking	1
Creating a new folder	1
Tree menu	1
None	1
Total	16

Table 1. Comments on Two Things Liked

Related to tasks, two participants liked uploading a single file and organizing a file by dragging on the left sidebar. One participant liked the idea of right-clicking on the left sidebar to rename or delete a file. One participant liked the easiness of creating a new folder.

Regardless of tasks, participants liked the look and feel of the Lifetime Library interface. Four participants liked the simple look of the interface. Two participants liked the color scheme used in the interface. One participant liked the location of the main menu because it is similar to other application placing a main menu on top. The left sidebar (tree menu) was also pointed out as a likable element of the interface due to its visibility of file structure.

On the other hand, Table 2 summarizes the negative comments. Four of the participants disliked the fact that the delete button was hard to find on the top menu, because the button was placed at the very right as a last menu item. The difficulty of bulk upload (uploading multiple files at once) was also mentioned four times.

Disliked	Number of comments
Placement of delete menu(had to look for it)	4
Bulk upload	4
Right-click	2
Menu items that are not normally found in other applications	1
Lack of help button or page	2
No notification after bulk-upload(User manually has to refresh the page again to check the task completion)	1
Windows-like look and feel	1
Not able to move file from the main screen (only available in tree)	1
Add a tag	1
Total	16

Table 2. Comments on Two Things Disliked

One participant specifically mentioned why he disliked the bulk upload: “The need to refresh to see the folder I had uploaded, which led to me trying to complete the task again several times when I had already done it correctly the first time.”

Two of the participants disliked right-clicking on the left sidebar because they thought this was not a normal action to take on a web browser. One participant said that she tried but failed to move a file by dragging it from the main screen to a folder displayed in the sidebar. She commented on the disliked section: “Not able to move a file from the “main” area (I had to actually go to the tree to move files.)”

4.2 Analysis of each task result

4.2.1 Task 1 - Upload a single file

4.2.1.1 Use case scenario and task

The first task assigned to a participant is to upload a single file. Since this is a very first task, the participant was provided with an overall scenario “*You are a new user to the Lifetime Library, and you are about to organize your personal photos on the Lifetime Library web interface. On your desktop, you have a folder named ‘my photos’ and the folder contains 5 photos.*” Followed by this overall scenario, the participant read the first task and its use case scenario: “*You want to store your photos to the life time library. As a first step, you would like to try uploading a single file to your Lifetime Library space. Upload ‘test.txt’ saved in the desktop to the Lifetime Library.*”

4.2.1.2 Optimal path

An optimal path to accomplish the first task (uploading a single file) requires five mouse clicks. A user mouse-overs on “Upload and Download” on the main menu, clicks “Upload” (Figure 9), clicks “Choose File” button (Figure 10), clicks the scroll bar to

scroll down to the file, clicks the file to upload from the desktop, and then clicks “open” (Figure 11).

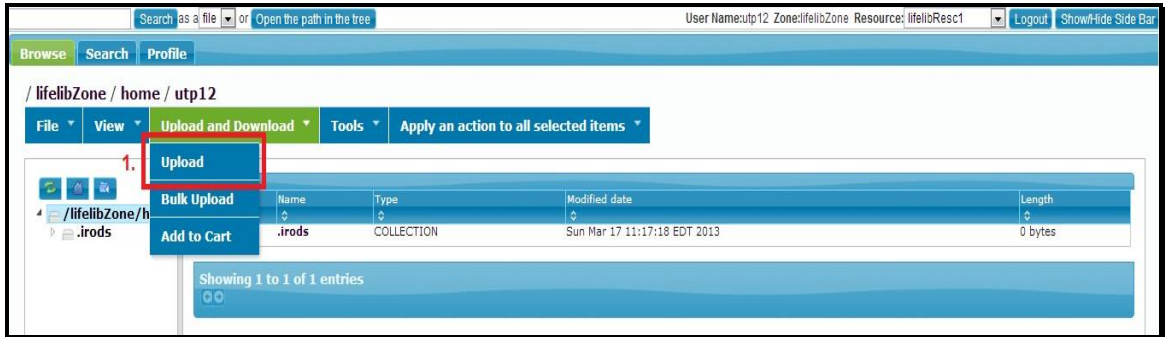


Figure 9. Task 1 - Click 1

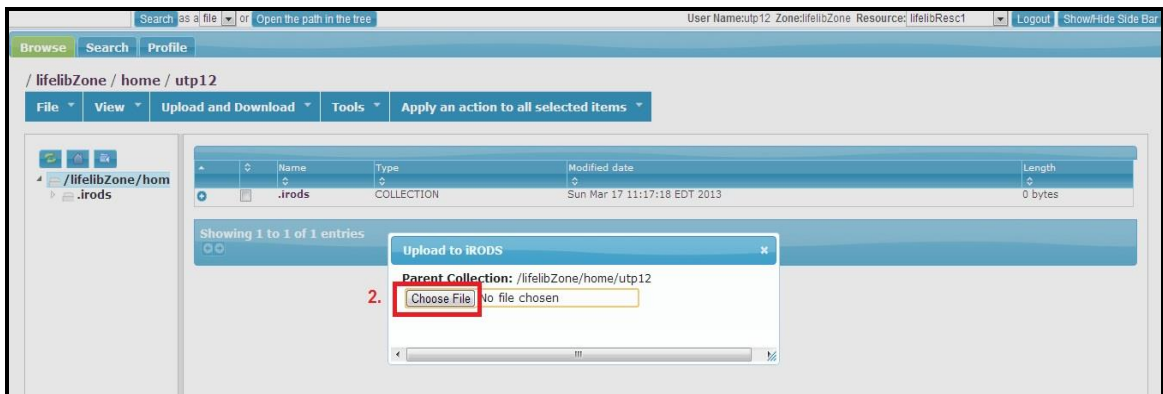


Figure 10. Task 1 - Click 2

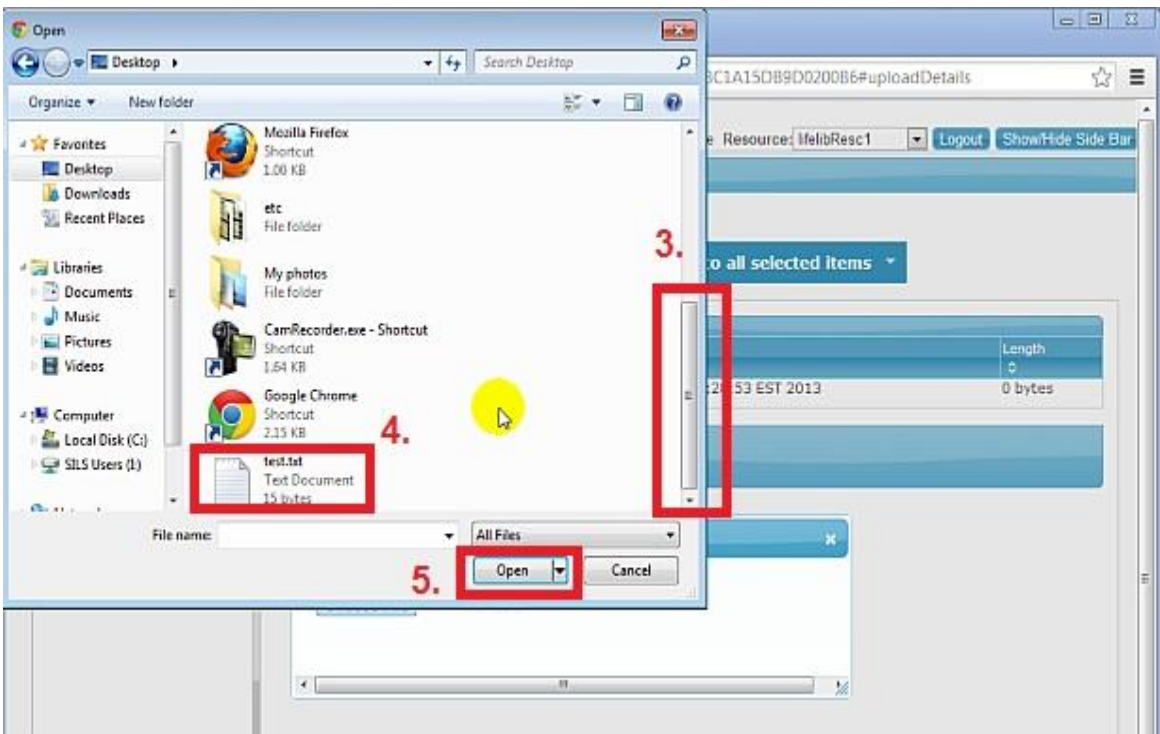


Figure 11. Task 1 - Click 3, 4, and 5

4.2.1.3 Task completion rate and time

It was a very easy task for all participants. All participants easily accomplished this task. The average time to finish the task was about 31.69 seconds.

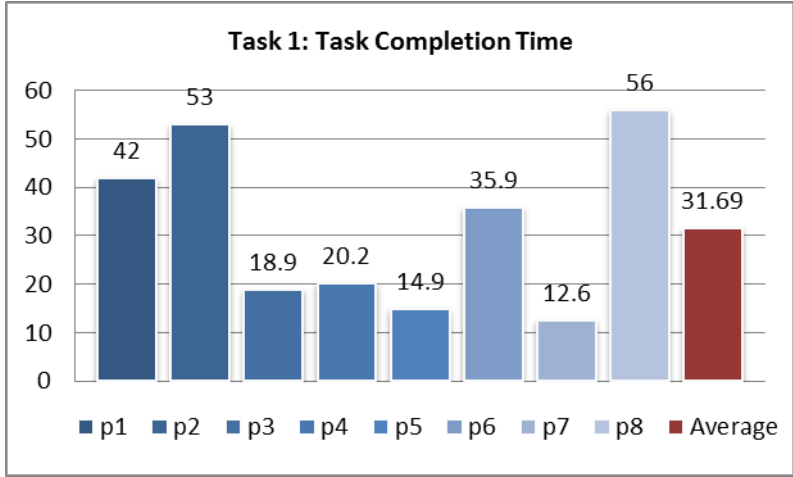


Figure 12. Task 1 - Task Completion Time

4.2.1.4 Number of clicks

The optimal path to complete this task needed five mouse clicks. On average, participants clicked seven times to finish this task.

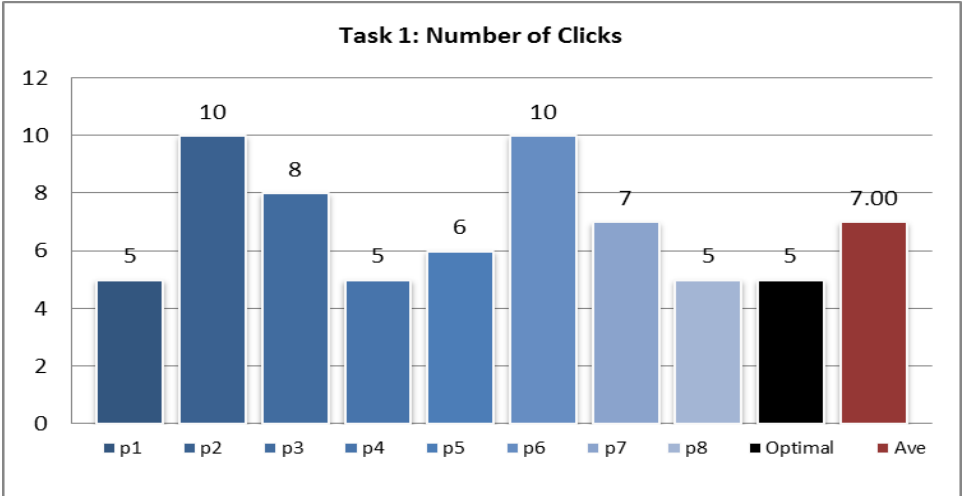


Figure 13. Task 1 - Number of Clicks

4.2.1.5 Confidence in completion of task

Participants were asked to answer a question after each task, to understand how participants perceived if they completed the task. The question was “How confident are you that you completed this task successfully?”, and five Likert-scale options were given: from “Not at all confident (1)” to “Very confident (5)”. For the first task, participants felt very confident about their completion of the task. Seven out of eight participants answered “Very confident (5)” to the first task, and one participant answered “Confident (4)”. The average score of the confidence in completion of task 1 is 4.88 out of 5.

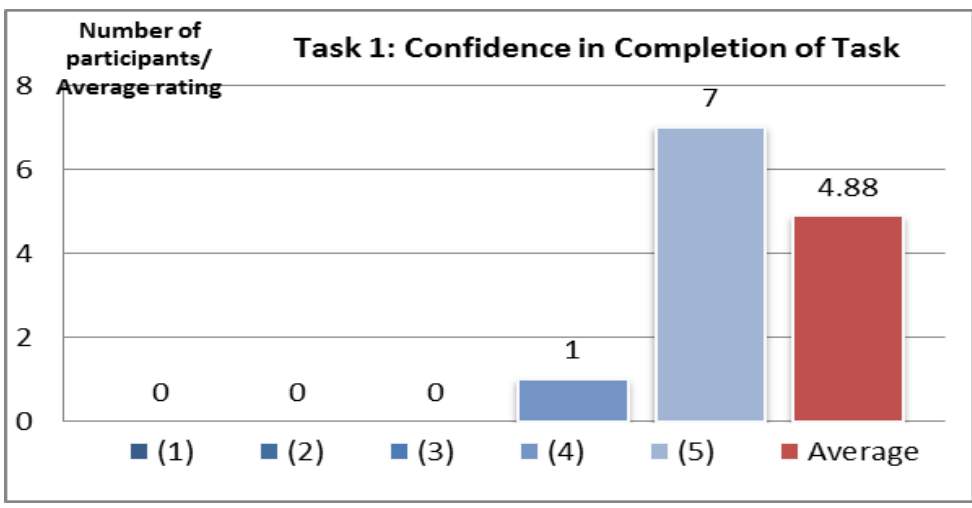


Figure 14. Task 1 - Confidence in Completion of Task

4.2.1.6 Perceived difficulty

Participants were asked to answer a question after each task, to understand how participants perceived the difficulty of the task. The prompt was: “Please rate how difficult the task was.”, and five Likert-scale options were given: from “Very Difficult (1)” to “Very easy (5)”. For the first task, participants felt it was very easy. Seven out of eight participants answered “Very easy” to the first task, and only one participant answered “Easy”. The average score of the perceived difficulty for this task is 4.88 out of 5.

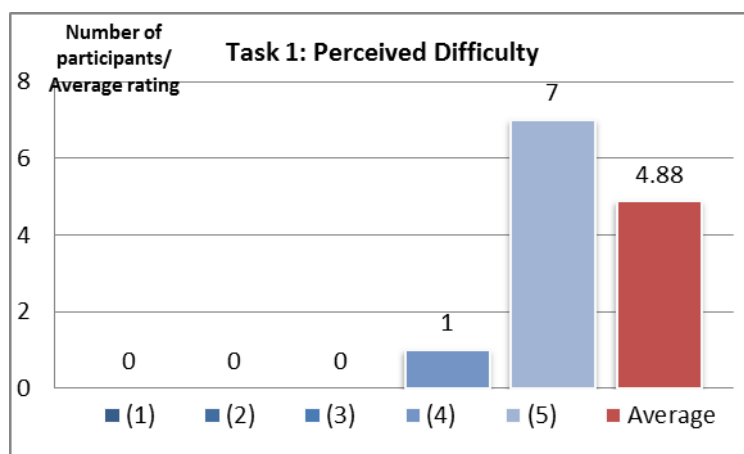


Figure 15. Task 1 - Perceived Difficulty

4.2.1.7 Participants comments

Participants were asked to provide a written comment about why they gave the rating on the perceived difficulty and confidence in completion of task questions. According to participants’ comments, the first task was very “straightforward” to all participants, and a couple of things were mentioned by participants as to what made this task easy. Three participants said that the “Upload” icon was very visible. Another three participants said that the Lifetime Library web interface was similar to other web applications, which made the use of the system easy.

4.2.1.8 Other observations

Participants were able to quickly figure out where to click and how to upload the file. However, one interesting action was observed. A participant tried to drag the “test.txt” file from the desktop and drop it directly into the browser. When dragging and dropping the file, the text file was opened on the web browser, and the file did not get uploaded to the Lifetime Library. It was interesting to see that the participant tried to use the Lifetime Library web interface like other ordinary file management systems, dragging and dropping a file to move it from one location to another. Although the participant failed to accomplish the task, he was able to quickly find the right path from the menu and completed the task successfully.

4.2.2 Task 2 – Upload multiple files at once

4.2.2.1 Use case scenario and task

The second task was to upload a number of files at once. A use case scenario and task were given to all participants: *“Now you want to upload the ‘my photos’ folder. Upload the ‘my photos’ folder to the top level of your Lifetime Library.”* For this task, participants had to upload a folder containing five photos at once, instead of uploading photos one by one.

4.2.2.2 Optimal path

The way to accomplish uploading multiple files at once is as follows: First, a participant has to click the “Bulk Upload” (Figure 16) button under “Upload and Download” menu.

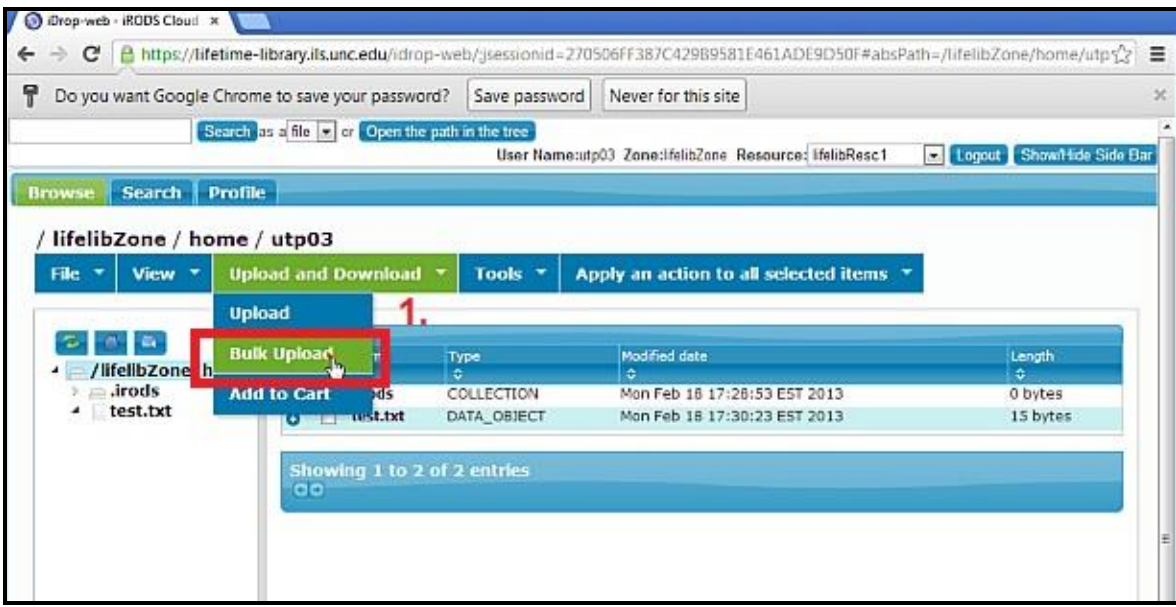


Figure 16. Task 2 - Click 1

Then the participant has to click the “Run this time” button, in order to run the java application (Figure 17 and Figure 18).

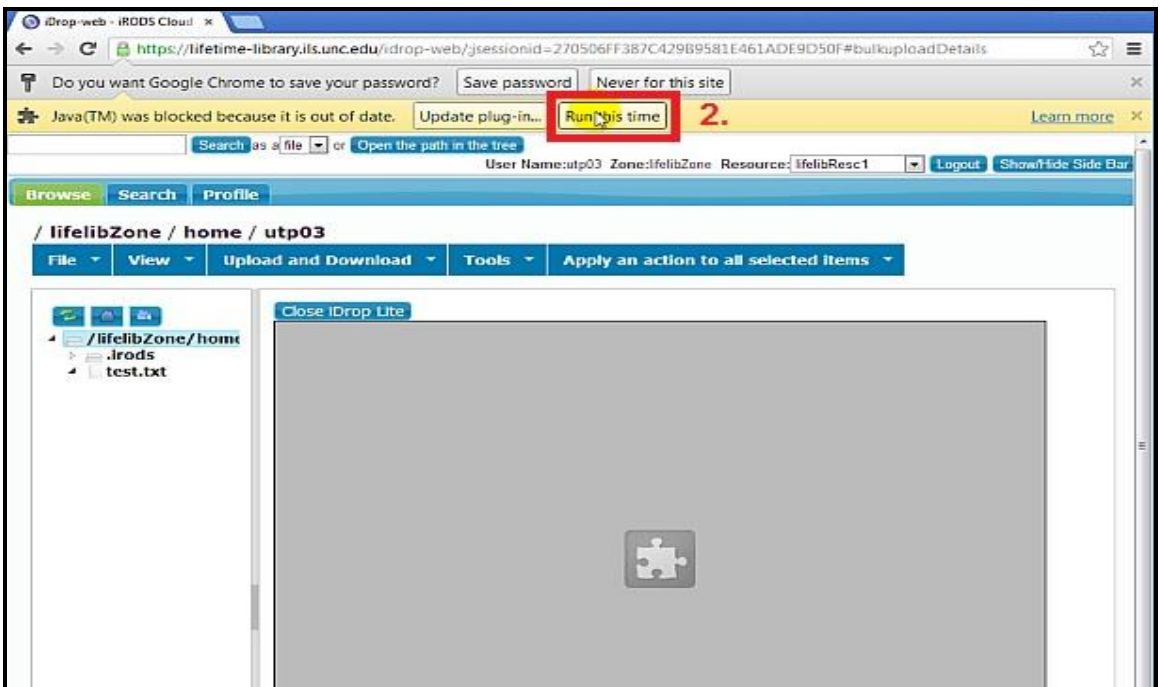


Figure 17. Task 2 - Click 2



Figure 18. Task 2 - Click 3

As shown in the Figure 19, once the java application starts, the participant has to navigate to the files (C:> All Users > sieun17> Desktop> My photos>). The participant has to click the “my photos” folder name, and then click the “Add Selected to Queue” button. After adding the folder to the queue, the “Import Files” button should be clicked to complete the process. When the application finishes the process, it will prompt a message to confirm the transfer (Figure 20).

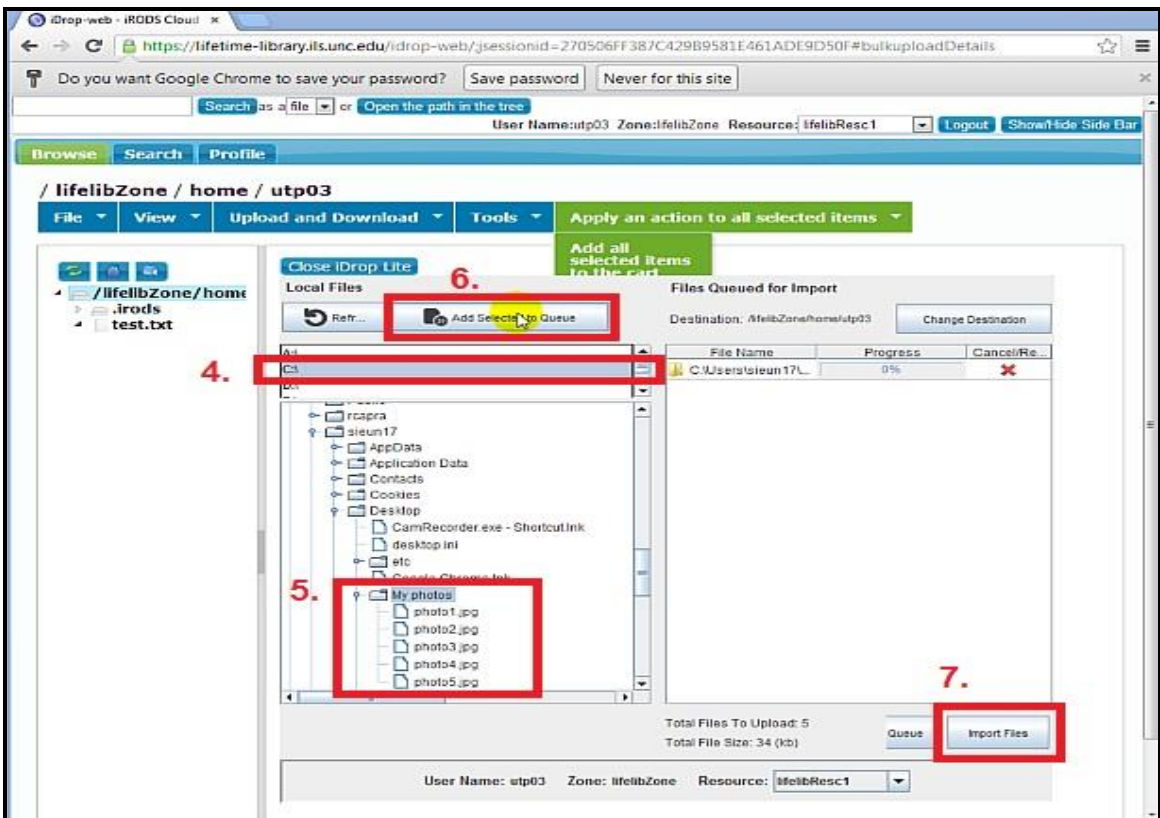


Figure 19. Task 2 - Click 4, 5, 6, and 7

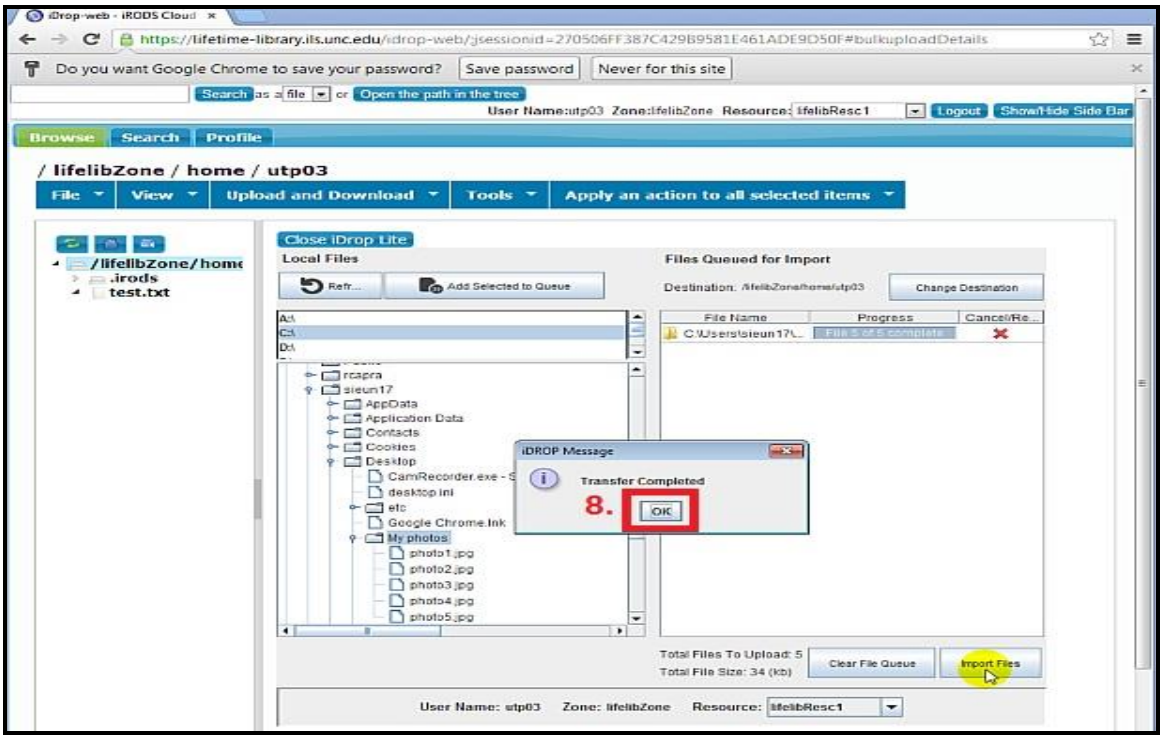


Figure 20. Task 2 - Click 8

4.2.2.3 Task completion rate and time

None of the participants were able to accomplish this task. Four minutes was the given time period for participants to complete each task, and anything beyond the four-minute mark was marked as a task completion failure. Seven out of the eight participants said they would like to give up this task before four minutes after they started the task. Only one participant was able to successfully finish this task, but the task completion time took 5 minutes and 27 seconds, longer than 4 minutes.

4.2.2.4 Perceived difficulty

As shown in Figure 21, when participants were asked to rate the difficulty of the second task, five out of eight participants rated it as “Very Difficult (1)”. The average score of the perceived difficulty for this task was 1.75. The participant who rated this task as “Easy” was the only one person who completed the task by himself, but took more than four minutes to complete the task.

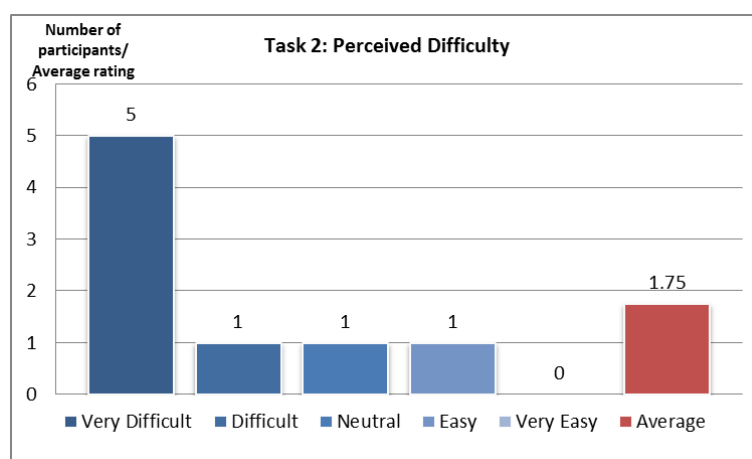


Figure 21. Task 2 - Perceived Difficulty

4.2.2.5 Confidence in completion of task

Although participants were not able to complete the task by themselves and most of them rated the task as very difficult, four participants answered that they were “very confident” in completion of the task. Three participants rated the task as “Not at all

confident”. This can be explained by the fact that the experimenter guided participants to complete the task. After participants declared they would like to give up the task, or passed the four minutes, the experimenter gave hints to the participants in order to observe their subsequent interactions with the system. The four participants rated this task as “very confident” because they finished the task with the help of the instructor.

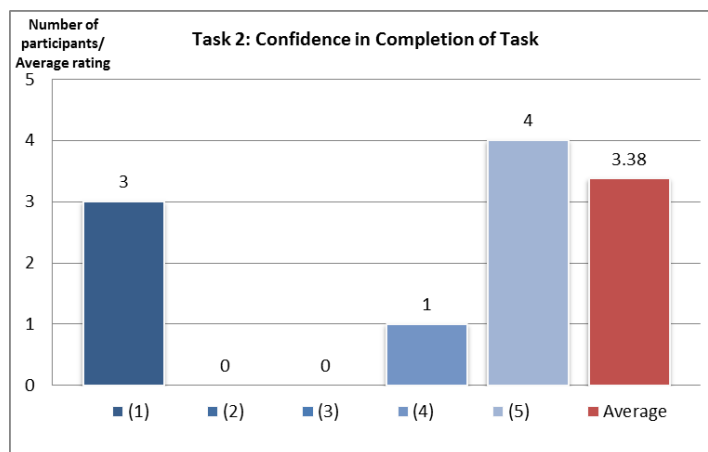


Figure 22. Task 2 - Confidence in Completion of Task

4.2.2.6 Participants' comments

The second task, uploading multiple files at once, was a difficult task for participants. A few issues related to this task were found in written responses from the participants.

First, running the java application seemed to be error-prone. In order to successfully run the application, a user has to click the “run this time” button in the pop-up menu. If a user clicks “install” java application, it will not work. Many participants did not click “run this time”, and the java application failed to run. To run the application again, participants had to close and reopen the browser.

Secondly, it was difficult for participants to find the folder location using the java application. In order to upload a number of files at once, a user has to navigate to the

destination folder from the very top level of file structure—the C: Drive. One participant said, “The system uses the drive letters, so you have to find My Documents or Desktop within the drive C. People usually don’t memorize that. Using the Windows Explorer structure would be familiar and great.” Another participant said, “I am very confident concerning the uploading task; however, I found it to be just a bit more difficult because of the file locations.”

Lastly, even after participants successfully ran the application and found the folder location with the experimenter’s instruction, they had a difficult time clicking the buttons in the right order. Some participants tried to “Import Files” without clicking the “Add selected to the queue” button. This action did not bring any result, and participants had to figure out why it did not work.

4.2.3 Task 3 – Rename a folder

4.2.3.1 Use case scenario and task

The third task was to change a folder name. The given use case scenario for this task was: *“Now you have the ‘my photos’ folder in your Lifetime Library space. However, you want to change the folder name to ‘travel photos’. Change the folder name to ‘travel photos’.”*

4.2.3.2 Optimal path

The optimal path to complete this task requires two mouse clicks. A user right-clicks the folder name from the left sidebar, clicks “rename”, enters a new name, and then hits “Enter” (Figure 24).

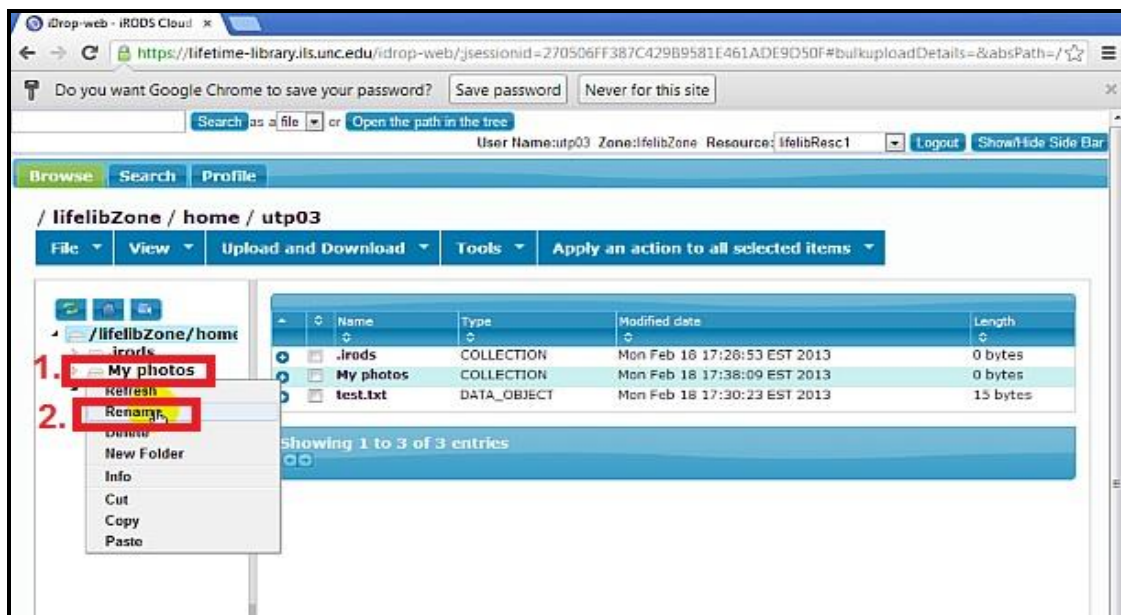


Figure 23. Task 3 - Click 1, and 2

4.2.3.3 Task completion rate and time

Six out of eight participants successfully completed this task. Two participants were not able to figure out how to complete the task within four minutes. Participants took 37.68 seconds on average to complete the task.

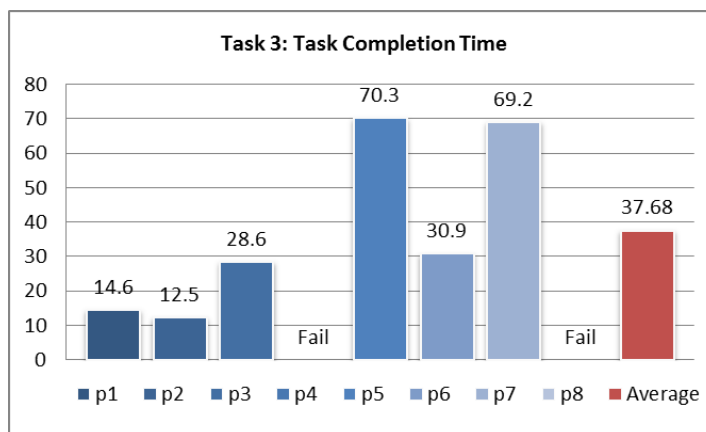


Figure 24. Task 3 - Task Completion Time

4.2.3.4 Number of clicks

The optimal path requires only two mouse clicks, and participants clicked the mouse 8.34 times on average in order to complete the third task. An interesting result is

that four out of six participants who successfully completed the task clicked their mouse less than 5 times. However, two participants clicked the mouse about 20 times to finish the task. The reason for the difference in the number of clicks will be discussed in the Other Observations section.

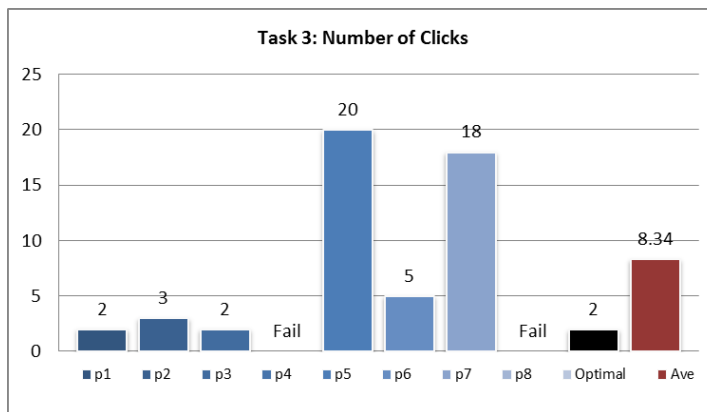


Figure 25. Task 3 - Number of Clicks

4.2.3.5 Perceived difficulty

The rates of the difficulty of the third task, renaming a folder name, shows that participants had varying experiences. Five participants rated this task as “Easy” or “Very easy”, but three participants rated this task as “Difficult” or “Neutral”. This means some were able to accomplish the task easily and quickly, but others struggled, as already discovered from the number of clicks.

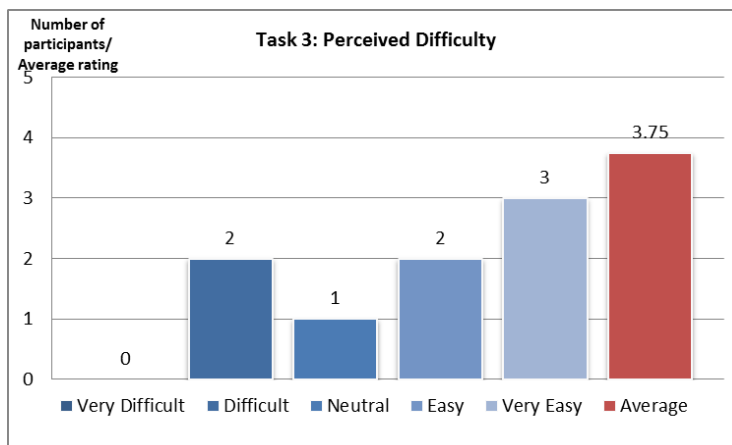


Figure 26. Task 3 - Perceived Difficulty

4.2.3.6 Confidence in completion of task

Most participants felt confident in completion of the third task. This was probably because a user was able to immediately see when a folder is created. The system confirms that a new folder is created with a pop-up message, and the system also refreshes its screen automatically so that a user can see the new folder on the screen easily.

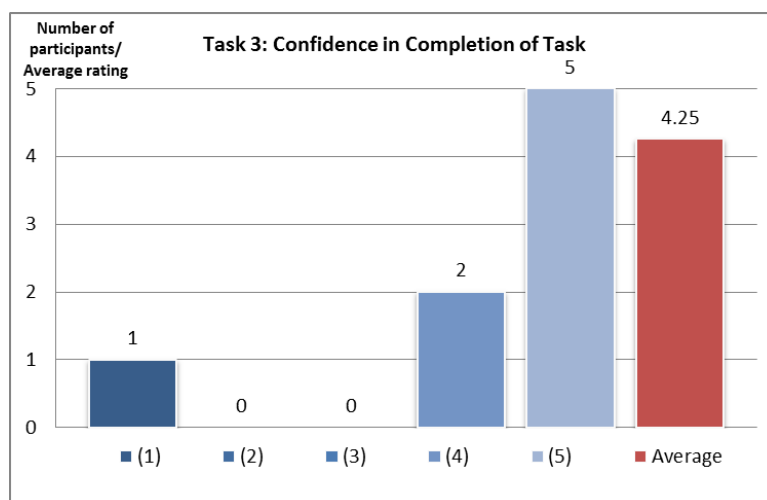


Figure 27. Task 3 - Confidence in Completion of Task

4.2.3.7 Participant comments and other observations

As observed in the number of clicks measurement, four participants clicked less than five times while two participants clicked about twenty times to complete the task. Also, as observed in the perceived difficulty question, five participants thought the task was easy, while three participants thought it was difficult. The reason for the polar-opposite experiences among participants could be found by observing participants' interaction with the system.

Correctly finding the “rename” button on the menu bar seemed to be an issue to some participants. Participants who successfully completed the task quickly right-clicked the file name from the sidebar and changed the file name. However, the two participants who failed the task got lost in the system. They clicked the main menu first, clicked the

file name on the main screen, and clicked all the buttons in the interface, but never reached the point of figuring out the process of right-clicking the file name on the sidebar to rename it. The two participants who completed the task but clicked about 20 times, first left-clicked the file name from the sidebar and searched the main menu to rename the file. Since the main menu bar does not provide a “rename” button, they clicked an icon that looked like a folder from the sidebar. This action led them to the very top level of the system, and they were forced to navigate through to the original folder structure. Then, suddenly, they experienced that Eureka moment, and were able to correctly right-click the folder name and click the “rename” button.

Participants’ positive comments about the task were about the simplicity and ease of right-clicking the file name to change the name: “I was able to change the file name immediately by clicking a right button of mouse,” and “(I am) familiar right click and rename function.” On the contrary, those who rated this task as a difficult one expressed their opinion that the action of right-clicking to rename a file is not something they would expect from a web browser. One participant said, “This is not intuitive” because “a web interface should not act as a desktop client with the right click action.” Another participant remarked, “Most desktop interfaces allow you to change file names this way. It was not intuitive because this is not a desktop interface.” Another user commented, “I could not figure out how to change the file name using the system. I clicked on all menus to see how to change it but I was not able to.” This shows that some users have different expectations with different interfaces; on a web browser, some users don’t expect that right-clicking will allow them to perform actions such as renaming a file.

In conclusion, the action of right-clicking to rename a file is an easy task by itself. However, getting to the idea of “right-clicking” was not easy for some participants because they did not expect the browser-based application to allow such desktop-like functions. This was also because participants tend to stick to one way of executing functions with the top menu bar.

4.2.4 Task 4 – Add a tag

4.2.4.1 Use case scenario and task

The fourth task was to add a tag to a photo. The use case scenario given was, “*You would like to manage your photos by adding tags to your photos. Add ‘tag1’ to the ‘photo 1’ file.*”

4.2.4.2 Optimal path

The optimal path to add a tag to the file required five mouse clicks. First, a user clicks the folder containing the file (Figure 28), clicks the “+” button next to the file (Figure 29), clicks the “Tags” field, enters a tag, and then clicks “Update Tags” (Figure 30). Once the tag is updated, the Lifetime Library interface shows a message on the right top corner, to confirm the process: “Tags and comments updated successfully.” (Figure 31).

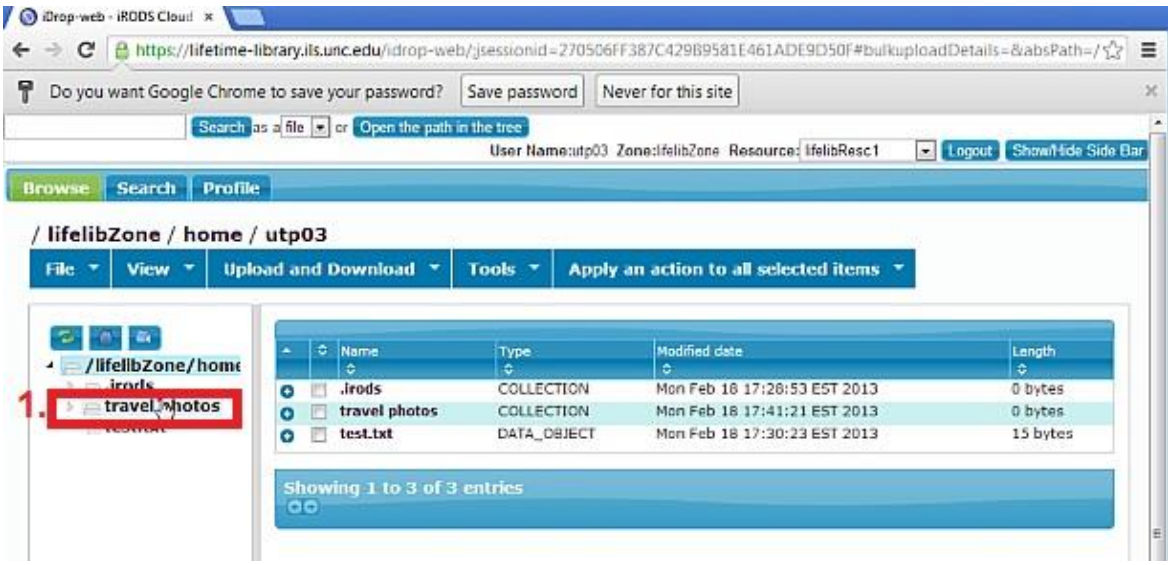


Figure 28. Task 4 - Click 1

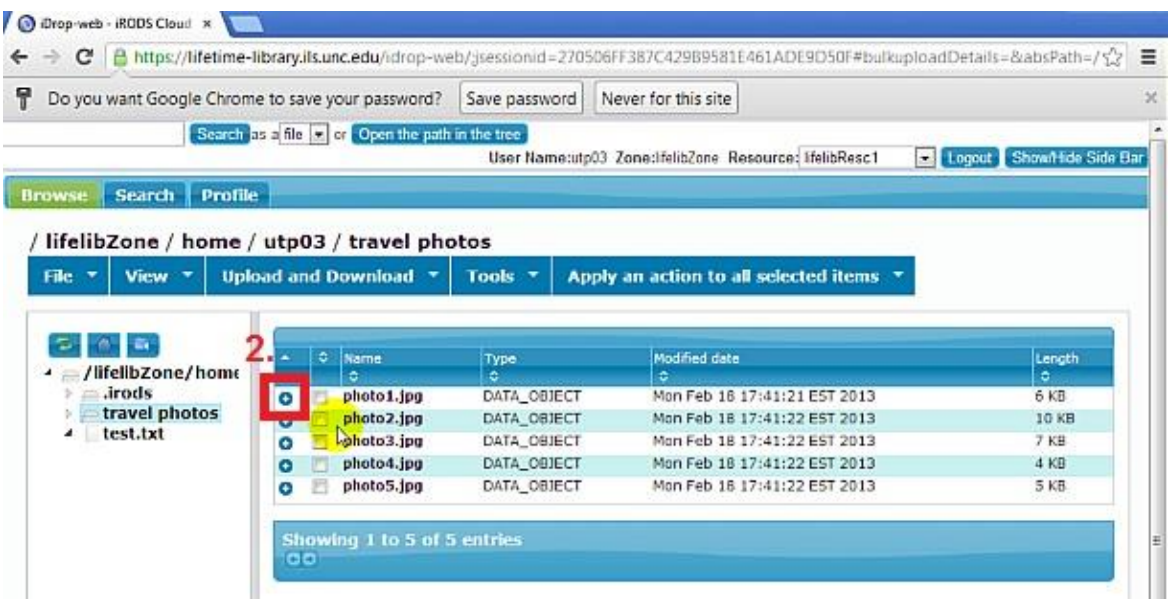


Figure 29. Task 4 - Click 2

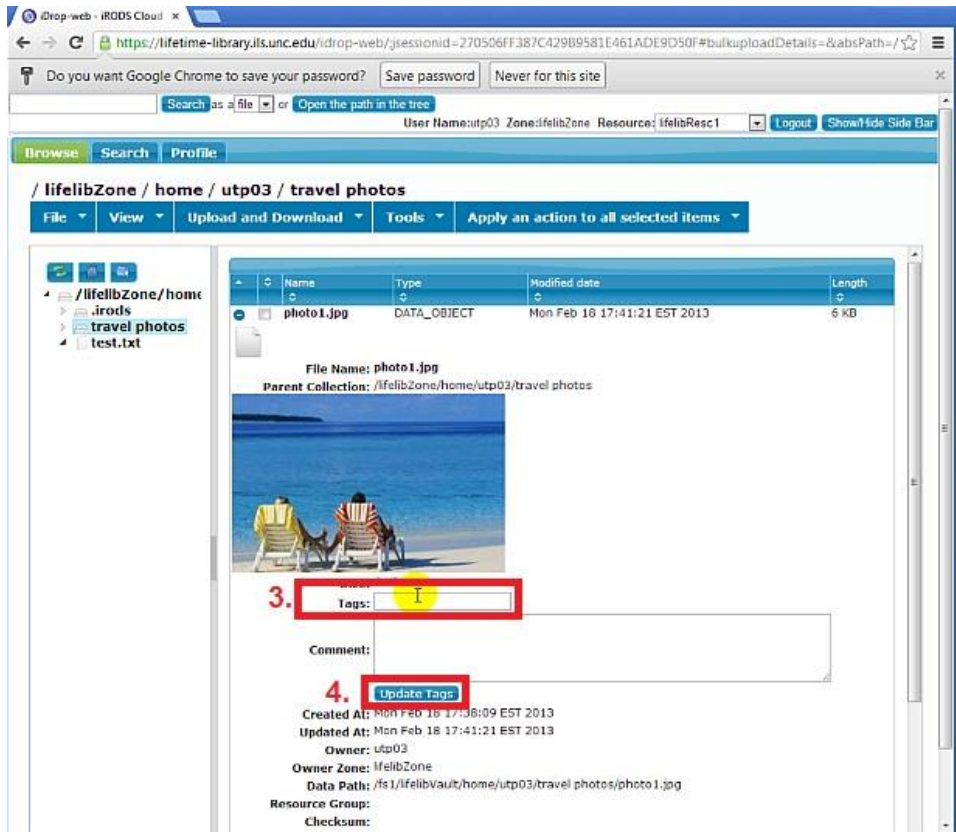


Figure 30. Task 4 - Click 3 and 4

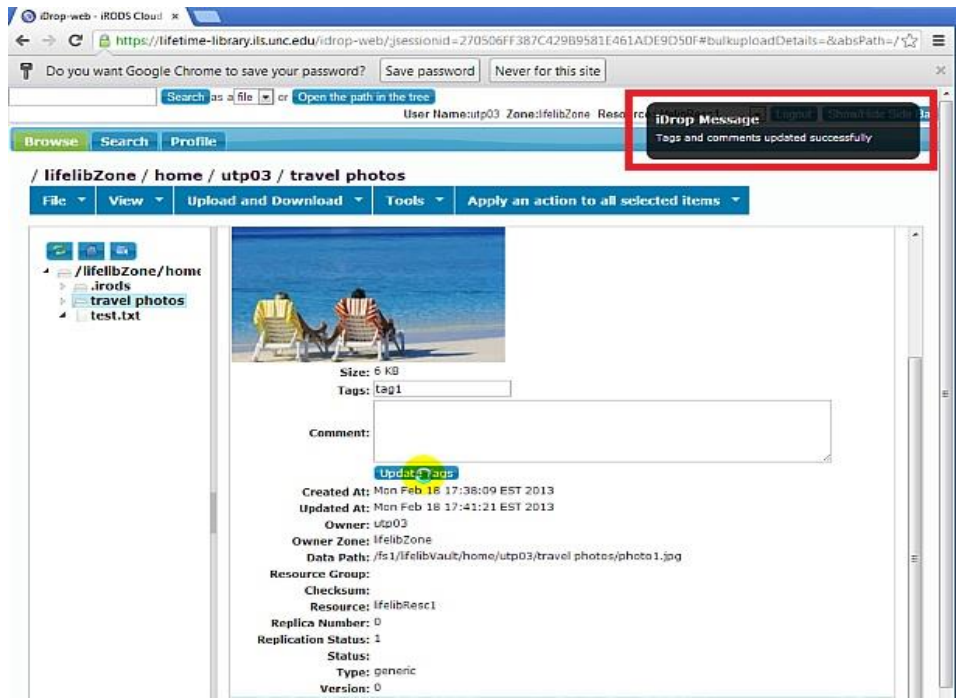


Figure 31. Task 4 - Confirmation Message

4.2.4.3 Task completion rate and time

Only one participant was not able to complete the task successfully. Participants took 34.44 seconds on average to complete the task.

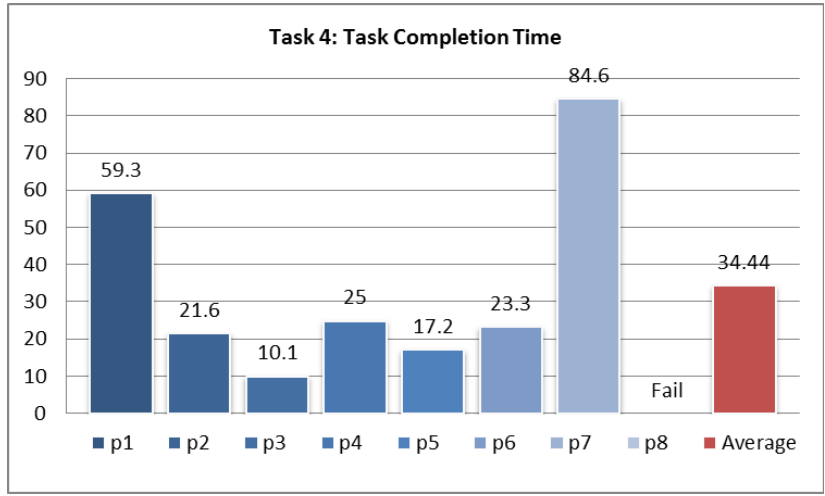


Figure 32. Task 4 - Task Completion Time

4.2.4.4 Number of clicks

The least number of clicks needed to complete this task was 5. On average, participants had to click 8.86 times to complete the task. One participant had an outstanding number of clicks: 25. The rest clicked 5 to 7 times.

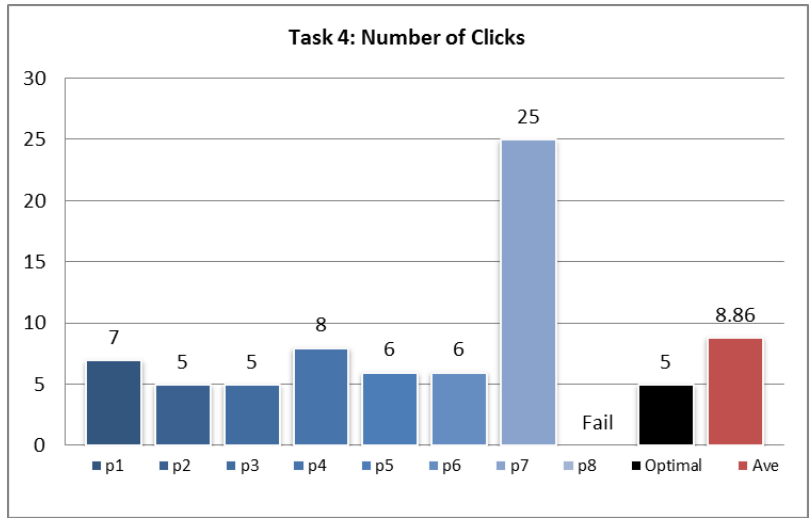


Figure 33. Task 4 - Number of Clicks

4.2.4.5 Perceived difficulty

The fourth task, adding a tag to a file, was an easy task to six participants. One participant rated it as a difficult task. The average score for the perceived difficulty was 3.88--close to “Easy”.

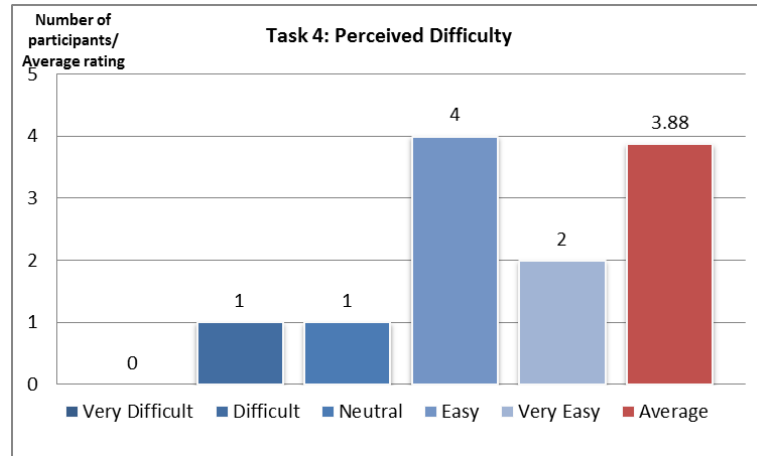


Figure 34. Task 4 - Perceived Difficulty

4.2.4.6 Confidence in completion of task

The average rating on confidence in completion of the fourth task was 4.25 out of 5. Six participants answered that they were confident in completing the task. Two participants were neutral about their confidence in completion of the task.

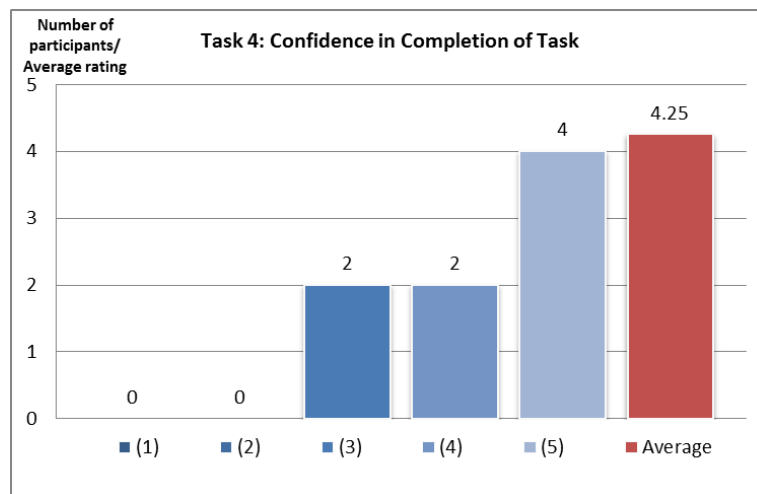


Figure 35. Task 4 - Confidence in Completion of Task

4.2.4.7 Participant comments and other observations

Seven participants added a tag to a file easily. One participant failed the task. One issue found from the observation of the six out of seven successful participants was that they were not able to find the tagging field immediately. They clicked other elements before getting to the tagging field. For example, four participants clicked the name of the file to be tagged from the main screen and this resulted in the downloading the file. Three participants right-clicked the file name on the main screen, which resulted in the display of an irrelevant menu. After clicking several wrong elements, participants finally clicked the “+” button next to the file name and were able to find the tag field there. One participant had to click many elements before getting to the right place. He downloaded the file by mistake, by clicking the file name from the main screen. He then checked the radio button of the file and searched the top menu. He spent a lot of time on searching the menu and trying every element on the menu. The “+” icon may not be obvious enough for participants to recognize it as a button to display the tag field.

Another concern was raised by a couple of participants. They said they were unsure if they completed the task because there was no notification message after adding a tag. Even though the system displayed a confirmation message on the right top corner of the interface, some users missed it. One participant commented that, “I think I did the task but the screen showing the tags makes it look like the task might not be completed.” This was also found by observing some participants behavior during the task. Some participants waited for a while even after they finished tagging, because she missed the prompt message. Some participants clicked another page and came back to the tag page to check if the tag was really added to the file.

4.2.5 Task 5 – Add metadata

4.2.5.1 Use case scenario and task

The fifth task was to add metadata to a file. The use case scenario and task given were: *“You would like to have your collection more organized by adding descriptive attributes to files. For example, you can specify where a photo was taken (location), when the photo was taken (time), who took the photo (photographer), etc. Add an attribute named ‘location’ and set its value as ‘UNC-Chapel Hill’ to the ‘photo 2’ in the ‘travel photos’ folder.”*

4.2.5.2 Optimal path

The optimal path to add metadata to the file required seven clicks. The user clicks the folder name from the left sidebar, clicks the file name, clicks the “metadata” tab, clicks the “create” button, clicks the “Attribute” field to enter attribute, clicks the “Value” field to enter value, and then clicks “Update” to complete adding metadata.

4.2.5.3 Task completion rate and time

Five out of eight participants completed the task in four minutes. On average, participants took 72.66 seconds to add metadata.

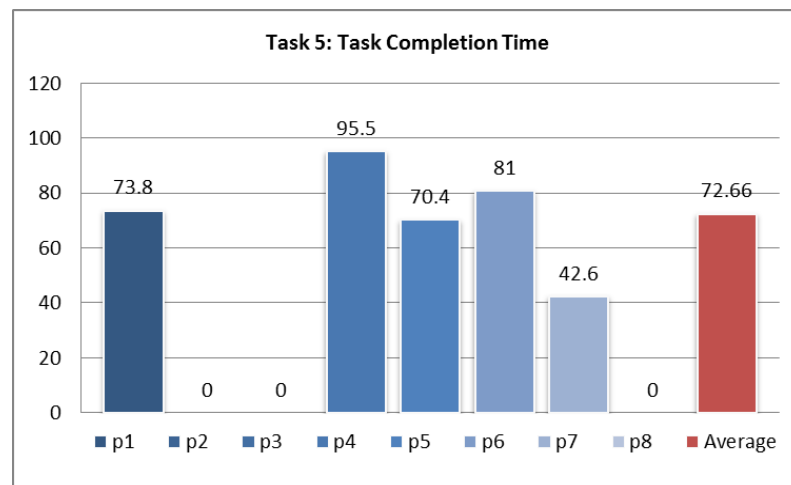


Figure 36. Task 5 - Task Completion Time

4.2.5.4 Number of clicks

On average, participants clicked 10.8 times to add metadata. The least number of clicks needed to accomplish the task was 7.

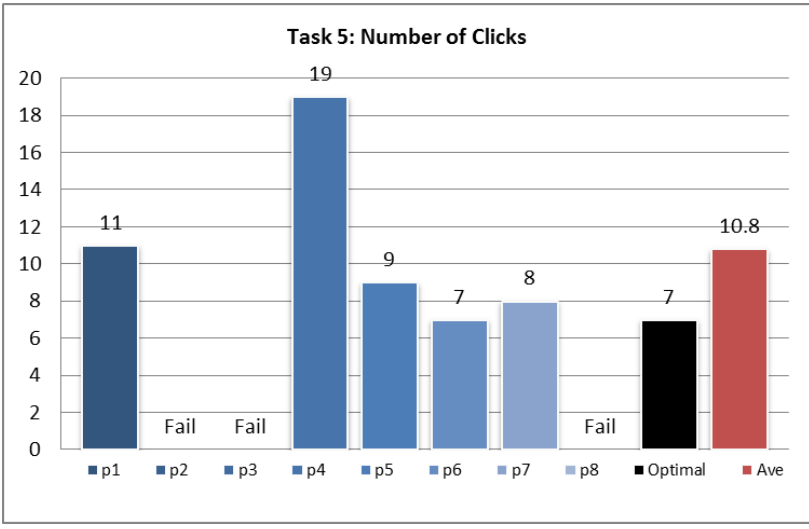


Figure 37. Task 5 - Number of Clicks

4.2.5.5 Perceived difficulty

Three participants rated the task as difficult. Other three participants rated “neutral,” one participant rated “easy,” and one participant rated “very easy”. On average, the perceived difficulty of the task was 2.75, more “difficult” than “easy.”

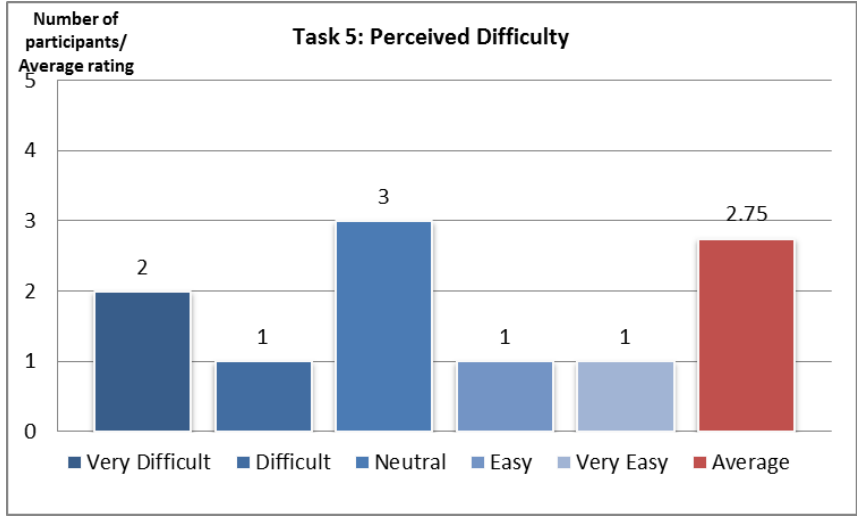


Figure 38. Task 5 - Perceived Difficulty

4.2.5.6 Confidence in completion of task

Five out of eight participants answered that they felt confident in the completion of the task. Two participants said they were not. The average score of confidence in completion of the task was 3.50, slightly more confident than not.

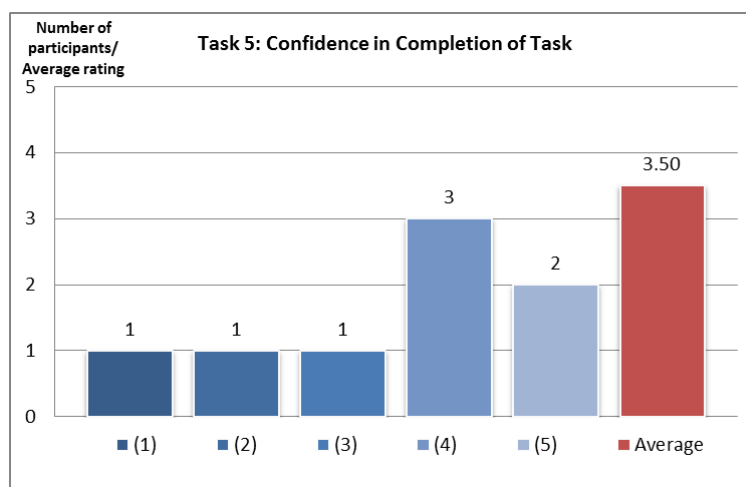


Figure 39. Task 5 - Confidence in Completion of Task

4.2.5.7 Participant comments and other observations

Three participants failed in this task. One participant gave up, one participant exceeded the given 4 minutes to complete the task, and the other participant thought he completed the task and went to the next step but did not add metadata to the correct file.

The participant who voluntarily gave up the task had difficulty finding the metadata page. In his comment, he said, “I gave up. (I) could not figure out how to add metadata to a photo. I expected it to be where I added the tag.” He clicked the ‘+’ button next to the file name on the main screen, and the page did provide the tag field but the metadata field. In order to get to the metadata field, a user has to click the file name from the sidebar. The discrepancy between the page accessed by “+” button and the page accessed by the sidebar confused him. The same behavior was observed in two other participants. Even participants who got to the right metadata page seemed to not

understand how they got there. “It was not obvious to locate where to add attributes but clicking around led me to it.”

The participant who exceeded the given four minutes to complete the task had a different perspective on adding metadata, which was the reason for the failure. Metadata can only be edited for one file at a time in this system. However, this participant believed the system could create a folder-wide master attribute first, and then add value to each file one by one. He said in a comment section: “As I understood the question, I was to create a folder-wide attribute “location” and then label (photo) #2 with ‘UNC’.” Because of the difference between his expectations of the system and the way the system works, he struggled while completing the task and resulted in spending four minutes.

Another participant thought he completed the task but did not actually complete it. He ended up adding metadata to the folder level, not to the file. He clicked the checkbox next to the file name and clicked “metadata” button from the menu. He probably assumed that the “metadata” button would be applied to the checked item. However, the action of clicking the checkbox is an invalid action in this system, because the checkbox is only for actions under the “Apply an action to all selected items” menu. That means when he clicked the “metadata” button from the menu, the system showed the metadata of the folder, not the file.

Participants raised other issues related to this task. One user said, “Most people don’t know what metadata is. It’s impossible to add these attributes without having prior knowledge of what all of this means.” Another said, “Someone who was not familiar with metadata would have a very difficult time figuring out this process.” Since participants were all students in the School of Information and Library Science, they were familiar

with terms such as metadata, attribute, and value. The Lifetime Library is currently open only to those students, but use of jargon is definitely something to consider in the future if the Lifetime Library is going to be available to other types of users.

4.2.6 Task 6 – Create a new folder

4.2.6.1 Use case scenario and task

The sixth task was to create a new folder. The use case scenario given was *“You realized that some of your photos in the ‘travel photos’ folder are not organized well. The photos are about animals, not traveling. You would like to create a new folder named ‘animal photos’ and move the photos to the new folder. Create a new folder named ‘animal photos’ on the same folder level (parallel) to the ‘travel photos’ folder.”*

4.2.6.2 Optimal path

A user can create a file with only two mouse clicks, by hovering a cursor on “File” in the top menu, clicking “New Folder”, typing a folder name, and then clicking the “update” button. A user can also create a file by right-clicking the sidebar menu, but it requires three mouse clicks in total; right-clicking the sidebar, clicking “New Folder”, and clicking “Update” button.

4.2.6.3 Task completion rate and time

All participants were able to complete this task successfully. On average, participants needed 48.51 seconds to create a new folder. By excluding the outlier, Participant 8, the average task completion time of Task 6 was 25.42 seconds.

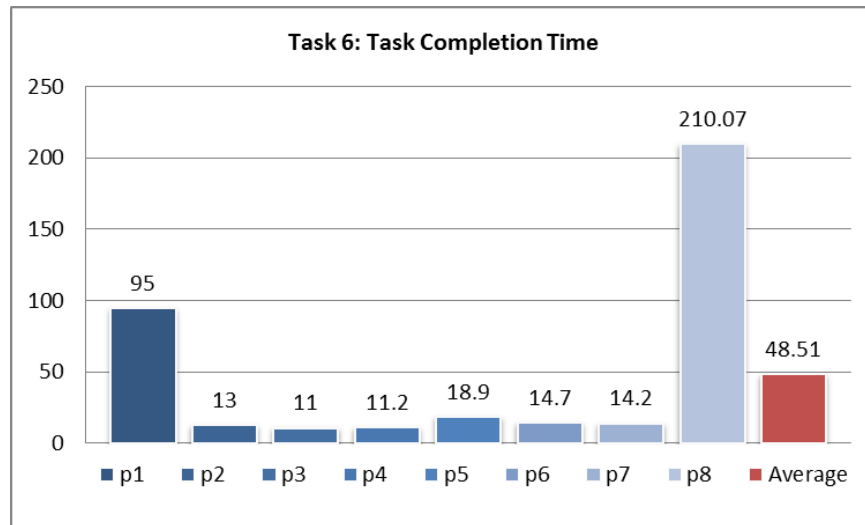


Figure 40. Task 6 - Task Completion Time

4.2.6.4 Number of clicks

Five out of eight participants were able to complete the task with only two mouse clicks, via the optimal path. On average, participants clicked 8.63 times to create a new folder.

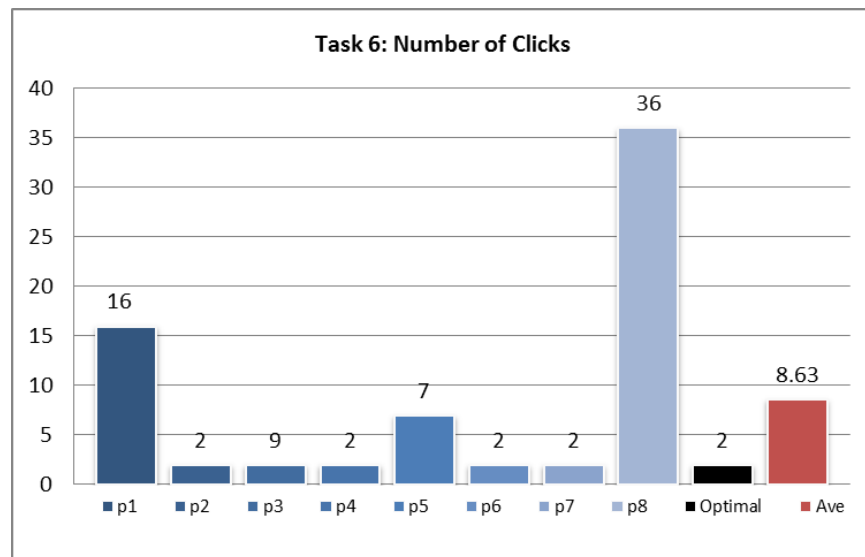


Figure 41. Task 6 - Number of Clicks

4.2.6.5 Perceived difficulty

Creating a new folder was an easy task for most of the participants. With the exception of one participant who rated the task as a “neutrally” difficult task, all

participants rated this task as “Easy” or “Very easy”. The average score of the difficulty of the task is 4.63 out of 5.

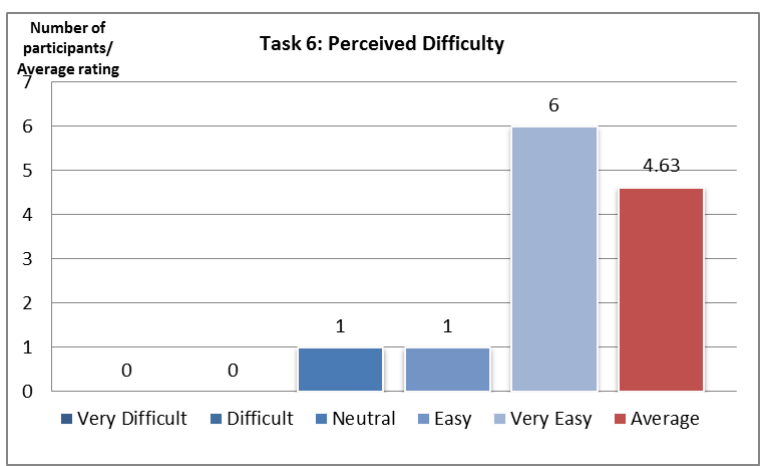


Figure 42. Task 6 - Perceived Difficulty

4.2.6.6 Confidence in completion of task

Participants were all confident that they completed the task successfully. The average rate of confidence in completion of the task was 4.88 out of 5.

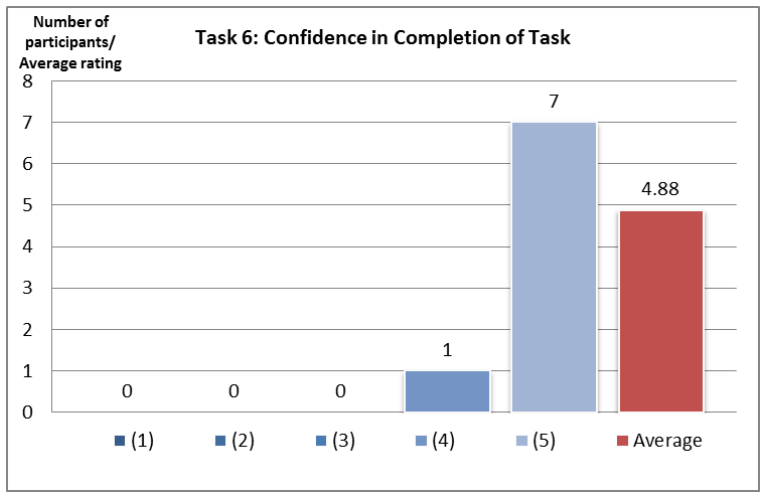


Figure 43. Task 6 - Confidence in Completion of Task

4.2.6.7 Participant comments and other observations

Five participants successfully completed the task via the optimal path. They wrote in the comment section that, “Creating a new folder is straightforward.” or “I love the easily visible dropdown menu option for creating a new folder!”

Three participants were off the optimal path for a couple of reasons. First of all, one participant tried to create a new folder by right-clicking the left side menu bar, as he did for renaming a folder. In order to create a new folder by right-clicking the left sidebar, he must click the exact folder name that the new folder will be included in. However, he clicked wrong locations, such as the white space around the folder name. He commented on a survey that, “I initially attempted to click anywhere within the sidebar to create a new folder in the same way that I renamed the folder. However, I was only given the option to create a new folder once I clicked on the parent folder.”

The second participant was off the optimal path because the system kept showing an error message: “No path was selected. Use the tree to select an iRods collection to upload the file to.” The error message meant that the participant had to designate (click) a folder name so that a new folder would be created. However, the error message was not clear enough for the participant to understand and correct his action. He kept trying to create a new folder and continued receiving the same error message four times. After several trials, he was able to click the parent folder and create a new folder.

4.2.7 Task 7 – Organize a file

4.2.7.1 Use case scenario and task

The seventh task was to organize, or move a file, from one location to another. A given scenario of the task was, “*Now you want to move the animal photos to the ‘animal photos’ folder. Move ‘photo 3’ to the new ‘animal photos’ folder.*”

4.2.7.2 Optimal path

There is only one way to complete this task. A user has to use the left sidebar to move a file. The path to move the “photo 3” file from “travel photos” folder to the

“animal photos” folder requires three clicks. A user clicks the “travel photos” folder on the left sidebar to view files under the folder. Then the user drags the “photo 3” file and drops it into the designated place. Then the user clicks “OK” confirm the action when the prompt message is displayed.

4.2.7.3 Task completion rate and time

Seven out of eight participants successfully moved the file. One participant failed the task because he could not figure out how to do it within the four minutes. Participants who completed the task took an average of 37.56 seconds to complete the task.

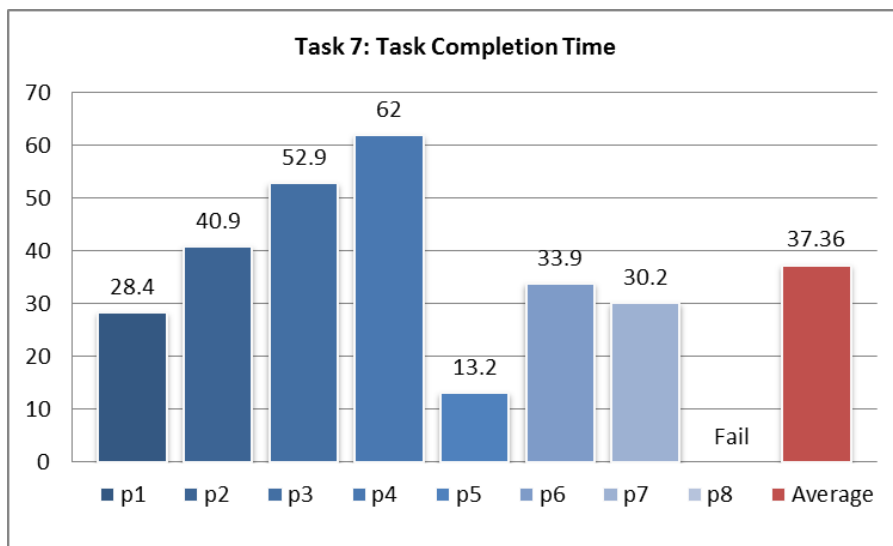


Figure 44. Task 7 - Task Completion Time

4.2.7.4 Number of clicks

Among seven participants who completed the task, five were able to move the file with less than 10 mouse clicks. Two participants had to click about 20 times to complete the task. On average, those who successfully completed the seventh task needed 10.14 clicks.

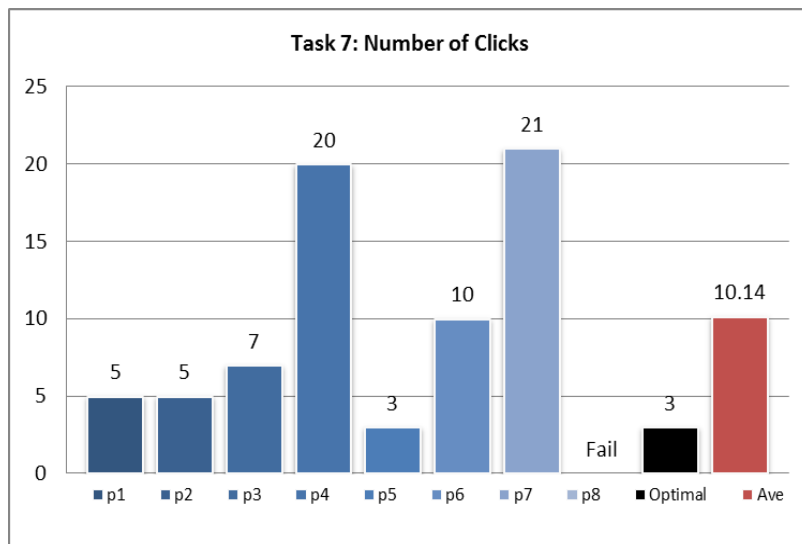


Figure 45. Task 7 - Number of Clicks

4.2.7.5 Perceived difficulty

Six participants thought the task was easy, while two described the task difficulty as neutral. The average perceived difficulty of Task 7 was 3.75 out of 5.

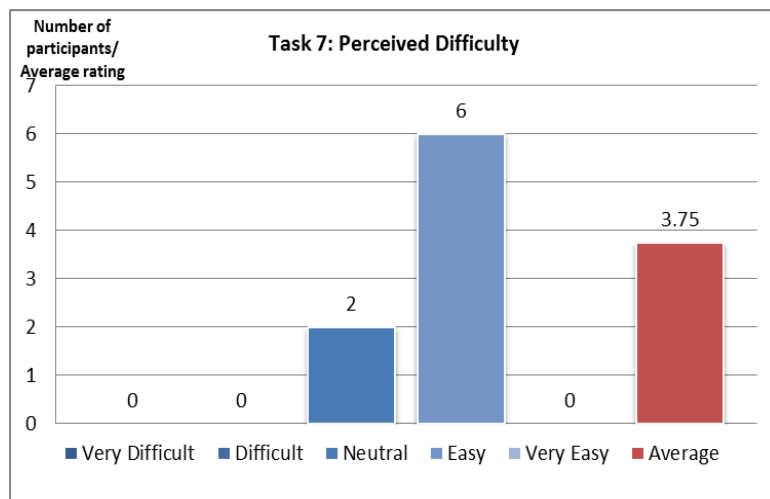


Figure 46. Task 7 - Perceived Difficulty

4.2.7.6 Confidence in completion of task

Participants were pretty confident that they successfully completed the task. Six participants answered they were “very confident” in the completion of the task, and two answered they were “confident” in the completion of the task. On average, the score was

4.75 out of 5. This was probably because the system showed a pop-up message immediately after the task was completed.

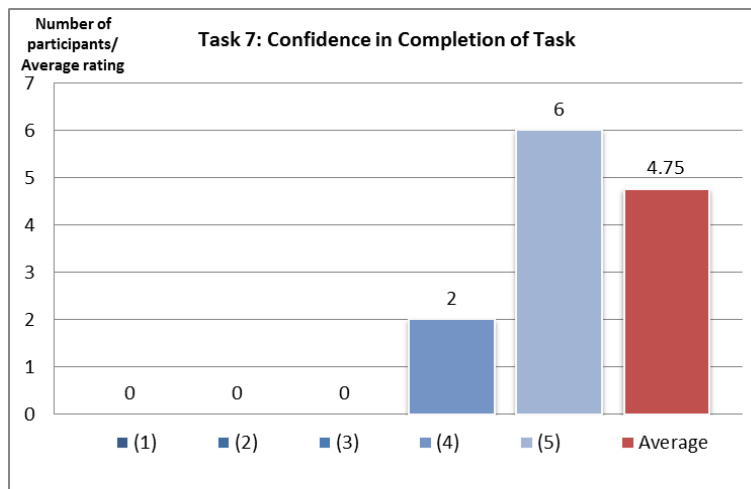


Figure 47. Task 7 - Confidence in Completion of Task

4.2.7.7 Participant comments and other observations

Seven out of eight participants successfully moved a file from one place to another and completed the task. Among the eight participants, two participants performed the task without any major difficulty. However, the other six participants all searched the interface for a while until they figured out how to complete the task. One of them failed to complete the task within the four-minute time frame.

The six participants all showed similar behaviors. They all first checked the checkbox of the “photo 3” file from the main screen, and then they searched the top menu to find a button that would allow them to move the file elsewhere. Once they found out there was no such button in the menu, they clicked the “+” button on the left of the “photo 3” file on the main screen. They looked throughout the page, but could not find anything to use to complete the task. After searching for a feature on the main screen, they switched their attention to the left sidebar, and from that point they were able to move “photo 3” to the designated folder by dragging-and-dropping the file.

This proves that if a user pays attention to the left sidebar firstly, it is an easy task. However, if a user pays attention to the main screen first, then she has to wander around the interface because the only way to move a file is to use the sidebar. Comments from participants illustrate this. One participant said, “To drag the photo to the folder worked pretty well without any difficulties.” Another said, “(It was) easy to figure out.” On the contrary, a participant answered, “I used drag and drop in the side navigational panel, which should not be typical in a web interface, and I also do not know an alternative way to do this.” Another said “Moving folders is easy ... once you know how to do it on the program.” Another participant also said “the task is easy once you know that drag and drop is possible.”

On top of the difficulty of coming up with the idea of drag-and-drop on the sidebar menu, another interesting behavior was observed. One participant tried to drag and drop the file from the main screen to the left sidebar. However, clicking a file name on the main screen does not allow the user to move it—instead, it results in downloading the file. The participant answered in the survey that, “I originally thought I could just click and drag the photo over to the new folder but it wouldn’t let me from the place I was at. So I went over to the ‘tree’ and got it to move from there.”

4.2.8 Task 8 – Delete a file

4.2.8.1 Use case scenario and task

Participants were asked to delete a single file. Participants were given a use case scenario and task: “*You realize that you don’t need the ‘test.txt’ file anymore in your collection. Delete the file from the Lifetime Library.*”

4.2.8.2 Optimal path

Users can accomplish this task by clicking only twice. A user has to check the checkbox of a file to be deleted, and then click “Delete all selected items” from the menu. Another way to delete a file is to right-click the file name on the left sidebar, click “delete,” and hit “OK” to confirm the action. This requires three mouse clicks.

4.2.8.3 Task completion rate and time

All participants successfully deleted a file. On average, 18.05 seconds were needed to complete the task.

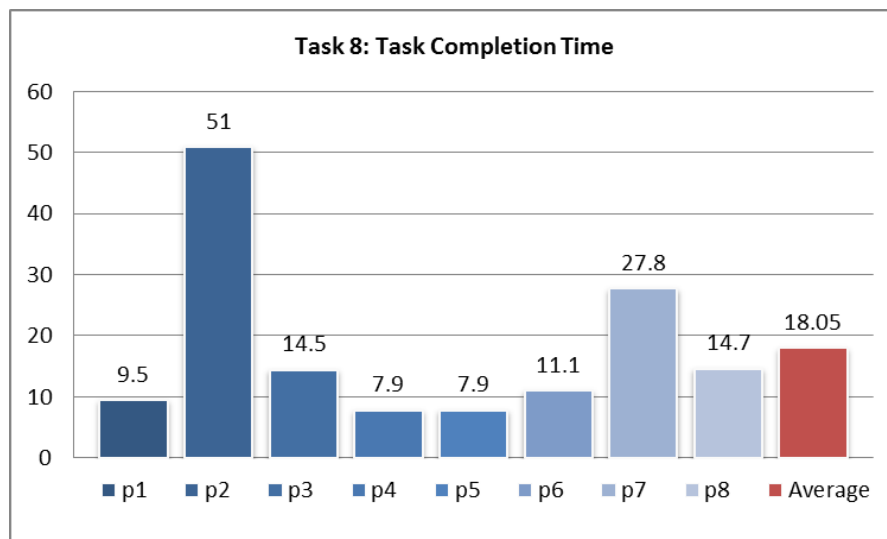


Figure 48. Task 8 - Task Completion Time

4.2.8.4 Number of clicks

Participants had to click anywhere from two to eight times to complete this task. On average, they clicked 4.875 times to delete the file.

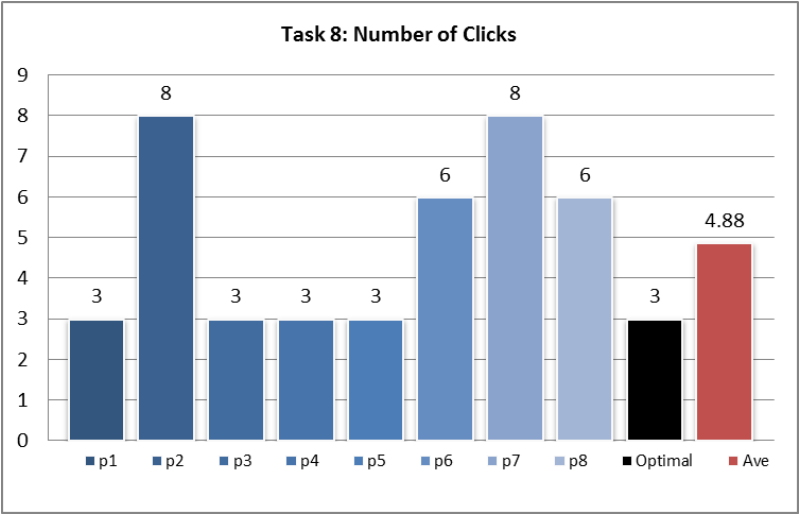


Figure 49. Task 8 - Number of Clicks

4.2.8.5 Perceived difficulty

This task was perceived as an easy task. All participants rated this task as an “Easy” or “Very easy” task. The average rate of the task was 4.75 out of 5.

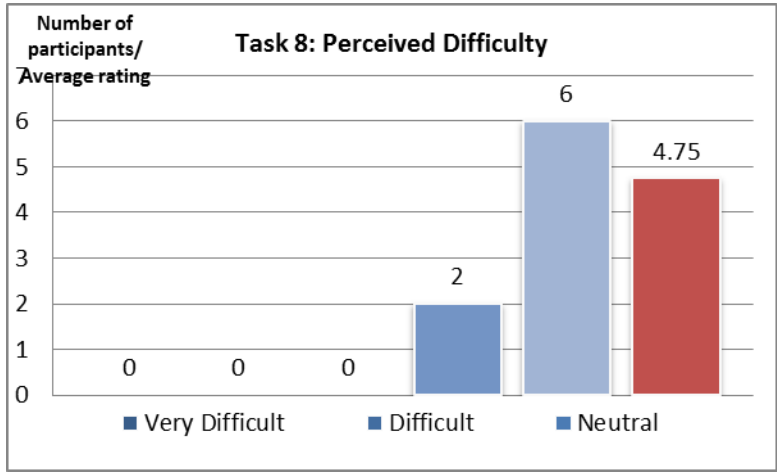


Figure 50. Task 8 - Perceived Difficulty

4.2.8.6 Confidence in completion of task

Participants were confident in their completion of the task. Eight out of the eight participants rated feeling “Very confident” in the completion of this task.

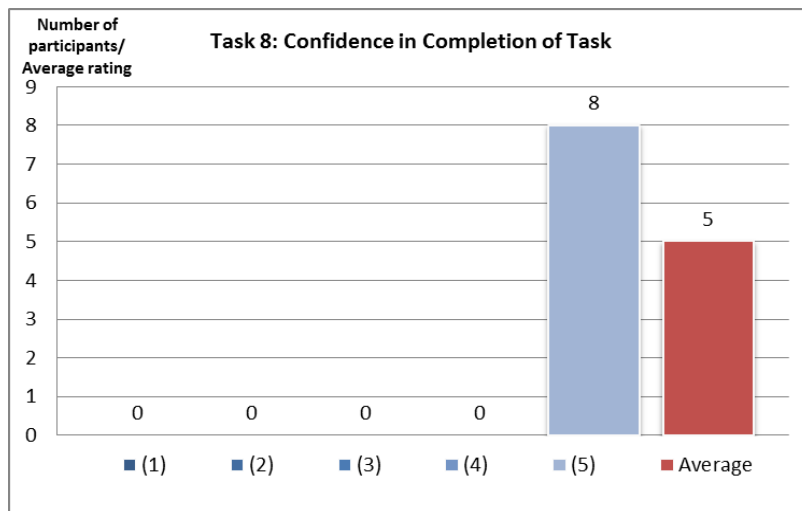


Figure 51. Task 8 - Confidence in Completion of Task

4.2.8.7 Participant comments and other observations

Among eight participants, five used the left sidebar to right-click the file name and delete it. The other three participants clicked the checkbox of the file and then used the menu bar to click “Delete all selected items”. The five participants felt that the task was intuitive and easy. One participant wrote the comment: “(I) like the past two tasks with file naming and creating, I right-clicked the unwanted file and selected delete. This was easy.” This shows that the participant’s previous experience from the past tasks influenced the ease with which they completed this task. This also shows that using the left sidebar to right-click file names and perform such tasks is easy for the participants.

The three participants who clicked the “Delete all selected items” button from the menu had to search the interface prior to the completion of the task. One participant expected a “delete” button to be located under the “File” menu, and when he did not find one, he had to look at all the menu tabs, and the “Delete all selected items” button was in the very last menu, “Apply an action to all selected items.”

A few participants expressed that they had an expectation for the system to have a “delete” icon on the main page. One of the three participants who used the menu to delete

the file actually clicked the “+” icon next to the file name in order to view the file information and find a “delete” button. However, the interface does not provide a “delete” icon. On this issue, one participant commented that, “I expected a delete button, not in the ‘apply action...’ tab. The tab name is too long.” Another participant commented, “Deleting itself is easy. And there are very few programs that do not have a delete button.”

4.2.9 Task 9 – Delete multiple files at once

4.2.9.1 Use case scenario and task

The last task was to delete multiple files at once. Participants were given a use case scenario: *“You realize that you have the same travel photos already stored somewhere on your Lifetime Library. The travel photos are redundant, so you want to delete them. Instead of deleting each file one by one, delete the 4 photos in the ‘travel photos’ folder all at once, but keep the ‘travel photos’ folder.”*

4.2.9.2 Optimal path

The optimal path to complete this task involves seven mouse clicks. A user has to click a file name to view files to delete, select all four files to delete, click “Delete all selected files” from the menu, and then hit “OK” to confirm the action.

4.2.9.3 Task completion rate and time

One participant failed to complete the task. Participants took anywhere from five to thirty seconds to complete the task. On average, they needed 24.34 seconds to delete the four files.

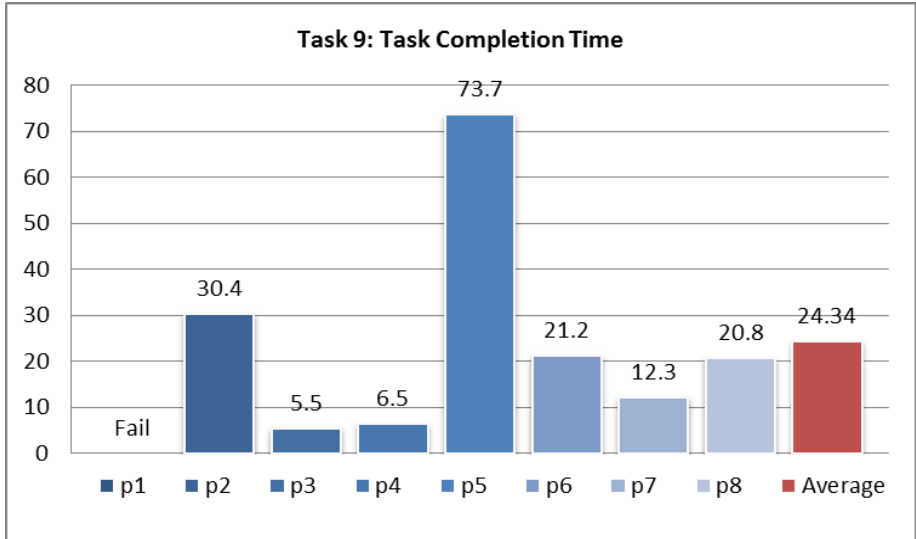


Figure 52. Task 9 - Task Completion Time

4.2.9.4 Number of clicks

In order to complete this task, at least seven mouse clicks are required. On average, participants clicked 14 times to complete the task.

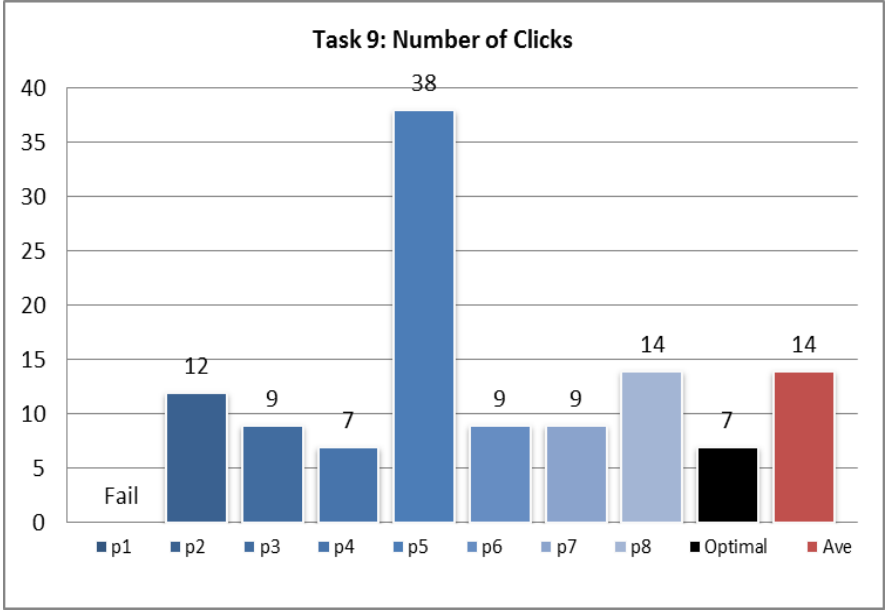


Figure 53. Task 9 - Number of Clicks

4.2.9.5 Perceived difficulty

The average score of the perceived difficulty of the task 9 was 4.125 out of 5. Participants perceived this task as a “very easy” task.

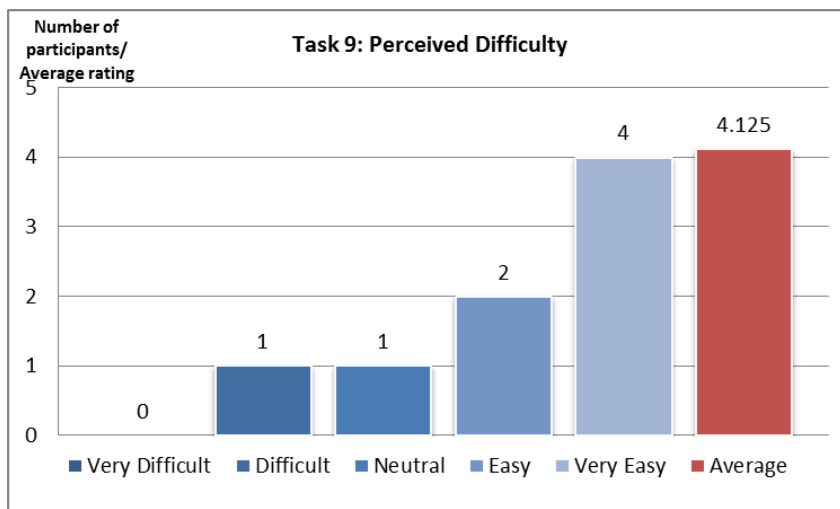


Figure 54. Task 9 - Perceived Difficulty

4.2.9.6 Confidence in completion of task

Seven out of eight participants rated that they were “very confident” in the completion of Task 9. On average, the task completion confidence score was 4.63 out of 5.

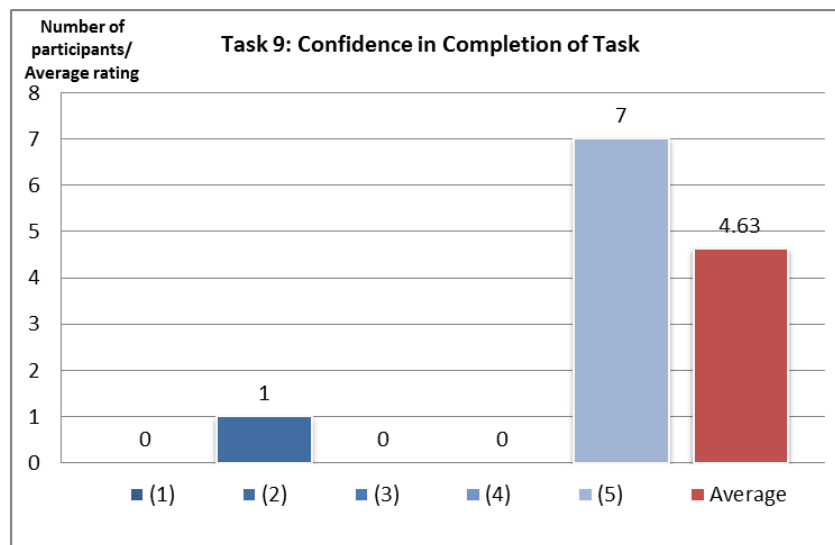


Figure 55. Task 9 - Confidence in Completion of Task

4.2.9.7 Participant comments and other observations

The task was easy for most of the participants. However, selecting all files to delete was tricky. In order to delete multiple files at once within the Lifetime Library

system, participants have to click the checkboxes of all files to be deleted one by one. Participants, however, attempted to use some different strategies to select multiple items.

Two participants used the Shift key to select all items to be deleted on the left sidebar. This is a behavior that users are likely to perform on a desktop folder. The participants pressed the Shift key and then clicked all files from the left side menu bar to select them all. However, the system does not provide such a feature. Since other tasks such as deleting a file or renaming a file were accomplished by right-clicking the file name on the left sidebar, participants tried to complete this task within the left sidebar as well, using an action that they would take within a desktop folder. A participant left the comment, “I tried to highlight then right click to delete the images I had selected in the sidebar, but that was not an option.”

Two participants tried to select all files to delete by clicking an icon on top of all the checkboxes. This action actually does not produce any result from the system. A participant wrote the comment, “I expected a ‘select all’ function like the email clients have.” Since there is no such a feature in the system, the participant had to manually check all the checkboxes and then click the “Delete all selected items” button from the menu.

5 Discussion

The results of this study were analyzed within two different spectrums. Firstly, the overall usability of all tasks was analyzed, and then task-specific analyses were conducted. From the overall analysis, it was discovered that the average of System Usability Scale (SUS) scores collected from the participants was 40. Usually, a SUS score of 68 is considered average. This means that there are many ways the Lifetime Library Web interface can improve. In terms of task completion rate, the major issue in the interface was that none of the participants were able to complete Task 2--uploading multiple files at once. Participants struggled to run and navigate within the Java application. In addition, it was also discovered that there was a correlation between the task completion time and perceived difficulty. This indicates that the interface should aim to reduce the amount of time needed to complete each task. The tasks that participants took a relatively long time to complete and perceived as “difficult” were Tasks 2 and 5. Task 2 was to upload multiple files at once, and Task 5 was to add metadata to the file. For both tasks, participants had difficulty getting to a page that would allow them to make the necessary actions to complete the task. It is recommended to find a way to make the tasks more intuitive to users.

By looking at each task analysis, a number of usability issues were found. To begin with, it was found that the main menu is the first place that the participants look for features to complete tasks. This explains why the two tasks--uploading a file and creating a new folder--were easy. It is because they were readily available in the first main menu.

On the contrary, deleting a file was a difficult task because the delete button is placed as the very last menu item. Moving a file from one place to another was also not available on the main menu while participants looked for it from the main menu. It is necessary to include all basic file management features on the main menu, and make them visible, because participants perceived the main menu bar as the foremost place for completing tasks.

The interface should also aim for the consistency of the main menu and the left sidebar. The main menu bar should include all important file management features, and the left sidebar menu initiated by right-clicking should do the same as well. For instance, a menu item for renaming a file is only available by right-clicking the file name on the sidebar, but it is not available on the main menu bar. Participants addressed that it was difficult for them to look for the main menu and then right-click the sidebar to find a certain function, because some features are available on the main menu and some are not. To sum up, basic file management features should be available both in the main menu and on the sidebar menu initiated by right-clicking.

Moreover, the system should be more obvious in their delivery of desktop-like features, particularly right-clicking and dragging-and-dropping. Some participants liked the idea of right-clicking the left sidebar menu to rename or delete a file. On the other hand, some participants disliked the idea because right-clicking was a “desktop-like” feature that they do not likely to expect from a web browser application. However, even participants who disliked the idea of right-clicking on a web browser application found it convenient to use. The only problem was just coming up with the idea of right-clicking. Participants had the same opinion on the task of moving a file item by dragging-and-

dropping. It was an unexpected feature for participants, but they found it useful and easy to use. This means that the desktop-like features should be more apparent to the users.

If the Lifetime Library aims to provide desktop-like features such as right-clicking or drag-and-dropping, then they should be available across the entire interface. For example, one participant tried to drag and drop a file from the main screen to the sidebar menu to move the file. However, the drag-and-drop function to move a file is only available in the sidebar menu. The inconsistency of this desktop-likeness on the sidebar and on the main screen needs to be addressed.

The system should also revalue the importance of displaying information and downloading a file. Currently, the system is encouraging downloading features rather than displaying file information. When a participant clicks a file name on the main screen, the system initiates downloading the file instead of displaying file information such as tags or metadata. However, participants kept clicking filenames on the main screen to find file information, only to encounter download prompts. Participants expressed the inconvenience of viewing specific file information.

Notification messages after completing a task should be more visible and legible as well. Sometimes, a confirmation message was not provided after a completion of a task and it led participants questioning if the system truly performed what they commanded. For instance, after tagging, no notification message appeared, and participants kept watching the screen, waiting for a confirmation message. Some participants manually went out to another page and returned to a previous page to confirm the task completion. In addition to the lack of a confirmation message, an ambiguous message was an obstacle in completing a task. When creating a new folder, a

user must designate a location where the new folder will be created by selecting a folder location on the left sidebar. However, one participant did not specify a new folder's location, and the system showed an error message: *"No path was selected. Use the tree to select an iRods collection to upload the file to."* The term "iRods collection" was not clear to the participant and he kept trying to add a folder, and kept receiving the same error message.

6 Conclusion

The purpose of this study was to conduct a usability test on the web interface of the Lifetime Library, a shared file storage system provided by the School of Information and Library Science at UNC-Chapel Hill. A number of qualitative and quantitative values were recorded and measured during each test. The results of the study suggested areas for improvement in the usability of the current usability status of the Lifetime Library web interface. The results of the study is expected to benefit the developer group of the Lifetime Library by enabling them to understand how well the interface is presented to its users, and prioritize their future works. Additionally, there has not been much published usability research on basic cloud-based file management features. For this reason, this study hopes to help usability researchers in the field of cloud-based system to think of fundamental design principles for basic file management use cases such as uploading, creating, deleting, organizing, renaming files and folders, and adding metadata and tags to those files.

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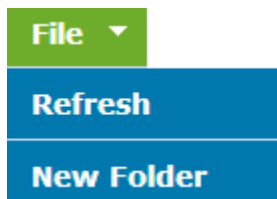
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8 Appendix

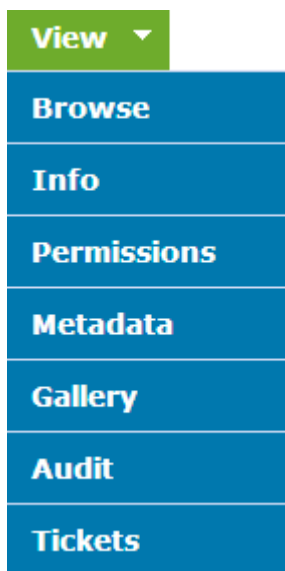
8.1 Appendix A: Main Menu Items of Lifetime Library



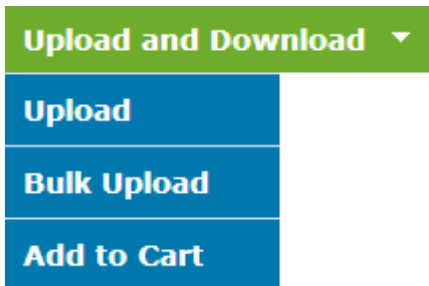
1. Lifetime Library Main Menu Bar



2. File Menu



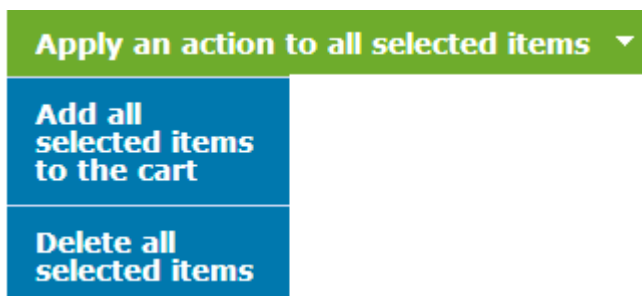
3. View Menu



4. Upload and Download Menu



5. Tools Menu



6. Apply an action to all selected items Menu

8.2 Appendix B: Directions and Qualtrics Survey

Instruction

Thank you so much for your decision to participate in this study.

The Lifetime Library consists of a shared storage and associated services provided by the School of Information and Library Science at UNC Chapel Hill. This study will examine aspects of how the Lifetime Library web interface supports users' basic file management tasks. The purpose of this study is to observe how users perform basic file managing tasks on the Lifetime Library web interface, in order to help make the interface more easy to use and user-friendly.

You will be given a scenario that asks you to imagine that you are working with your digital photos. You will be asked to use the Lifetime Library web interface to perform a number of file managing tasks such as uploading a file, deleting a file, organizing files, etc. After completing the tasks, you will be asked to fill out very short questionnaires about your experience.

Here are a few things you need to keep in mind for each task:

- If you have a question about the task, please raise your hand and ask the experimenter.
- As you complete each task, **raise your hand** and inform the experimenter.
- Please don't close this window or go back to the previous page.

Task 1 Upload a Single File

Task 1.

You are a new user to the Lifetime Library, and you are about to organize your personal photos on the Lifetime Library web interface. On your desktop, you have a folder named 'my photos' and the folder contains 5 photos.

You want to store your photos to the Lifetime Library. As a first step, you would like to try uploading a single file to your Lifetime Library space. **Upload 'test.txt' saved in the desktop to the Lifetime Library.**

- If you have a question about the task, please raise your hand and ask the experimenter.
- If you complete the task, **raise your hand** and inform the experimenter.
- Please don't go back to the previous page or close this window.

you FINISHED your task.

- Go to next page only when

Q1-Q4 Upload a Single File

Your task was to upload a single file, with a given scenario:

"You want to store your photos to the Lifetime Library. As a first step, you would like to try uploading a single file to your Lifetime Library space. Upload 'test.txt' saved in the desktop to the Lifetime Library."

How confident are you that you completed this task successfully?

Not at all confident Very confident

Please rate how difficult the task was.

Very Difficult Very Easy

For the question above, please explain why you gave the rating above.

Did you have any problems while completing this task?

Stop

Stop here. Don't go to the next page. Please raise your hand and wait for your experimenter's instruction.

Task2 Upload Multiple Files at Once

Task 2.

Now you want to upload the 'my photos' folder. Upload the 'my photos' folder to the top level of your Lifetime Library.

- If you have a question about the task, please raise your hand and ask the experimenter.
- If you complete the task, **raise your hand** and inform the experimenter.
- Please don't go back to the previous page or close this window.

when you **finished** your task.

- Go to next page only

Q5-Q8 Upload Multiple Files at Once

Your task was to upload a number of files at once, with a given scenario:

"Now you want to upload the 'my photos' folder. Upload the 'my photos' folder to the top level of your Lifetime Library. "

How confident are you that you completed this task successfully?

Not at all confident Very Confident

Please rate how difficult the task was.

Very Difficult Very Easy

For the question above, please explain why you gave the rating above.

Did you have any problem while completing this task?

Task3 Change a File/Folder Name**Task 3.**

Now you have the 'my photos' folder in your Lifetime Library space. However, you want to change the folder name to 'travel photos'. Change the folder name to 'travel photos'.

- If you have a question about the task, please raise your hand and ask the experimenter.
- If you complete the task, **raise your hand** and inform the experimenter.
- Please don't go back to the previous page or close this window.

when you **finished** your task.

- Go to next page only

Q9-Q12 Change a File/Folder Name

Your task was to change a file/folder name, with a given scenario:

"Now you have the 'my photos' folder in your Lifetime Library space. However, you want to change the folder name to 'travel photos'. Change the folder name to 'travel photos'. "

How confident are you that you completed this task successfully?

Not at all confident Very Confident

Please rate how difficult the task was.

Very Difficult Very Easy

For the question above, please explain why you gave the rating above.

Did you have any problem while completing this task?

Task4 Add a Tag

Task 4.

You would like to manage your photos by adding tags to your photos. Add 'tag1' to the 'photo 1' file.

- If you have a question about the task, please raise your hand and ask the experimenter.
- If you complete the task, **raise your hand** and inform the experimenter.
- Please don't go back to the previous page or close this window.

you **finished** your task.

- Go to next page only when

Q13-Q16 Add a Tag

Your task was to add a tag to a photo, with a given scenario:

"You would like to manage your photos by adding tags to your photos. Add 'tag1' to the 'photo 1' file."

How confident are you that you completed this task successfully?

Not at all confident



Very Confident

Please rate how difficult the task was.

Very Difficult



Very Easy

For the question above, please explain why you gave the rating above.

Did you have any problem while completing this task?

Task5 Add Metadata**Task 5.**

You would like to have your collection more organized by adding descriptive attributes to files. For example, you can specify where a photo was taken (location), when the photo was taken(time), who took the photo(photographer), etc. Add an attribute named 'location' and set its value as 'UNC-Chapel Hill' to the 'photo 2' in the 'travel photos' folder.

- If you have a question about the task, please raise your hand and ask the experimenter.
- If you complete the task, **raise your hand** and inform the experimenter.
- Please don't go back to the previous page or close this window.

when you **finished** your task.

- Go to next page only

Q17-Q20 Add Metadata

Your task was to add metadata to a photo, with a given scenario:

"You would like to have your collection more organized by adding descriptive attributes to files. For example, you can specify where a photo was taken (location), when the photo was taken(time), who took the photo(photographer), etc. Add an attribute named 'location' and set its value as 'UNC-Chapel Hill' to the 'photo 2' in the 'travel photos' folder. "

How confident are you that you completed this task successfully?

Not at all confident Very Confident

Please rate how difficult the task was.

Very Difficult Very Easy

For the question above, please explain why you gave the rating above.

Did you have any problem while completing this task?

Task6 Create a New Folder

Task 6.

You realized that some of your photos in the 'travel photos' folder are not organized well. The photos are about animals, not traveling. You would like to create a new folder named 'animal photos' and move the photos to the new folder. Create a new folder named 'animal photos' on the same folder level (parallel) to the 'travel photos' folder.

- If you have a question about the task, please raise your hand and ask the experimenter.
- If you complete the task, **raise your hand** and inform the experimenter.
- Please don't go back to the previous page or close this window.

when you **finished** your task.

- Go to next page only

Q21-Q24 Create a New Folder

Your task was to create a new folder, with a given scenario:

"You realized that some of your photos in the 'travel photos' folder are not organized well. The photos are about animals, not traveling. You would like to create a new folder named 'animal photos' and move the photos to the new folder. Create a new folder named 'animal photos' on the same folder level (parallel) to the 'travel photos' folder. "

How confident are you that you completed this task successfully?

Not at all confident



Very Confident

Please rate how difficult the task was.

Very Difficult

Very Easy

For the question above, please explain why you gave the rating above.

Did you have any problem while completing this task?

Task7 Organize a File/Folder**Task 7.**

Now you want to move the animal photos to the 'animal photos' folder. Move 'photo 3' to the new 'animal photos' folder.

- If you have a question about the task, please raise your hand and ask the experimenter.
- If you complete the task, **raise your hand** and inform the experimenter.
- Please don't go back to the previous page or close this window.

- Go to next page only

when you **finished** your task.

Q25-Q28 Organize a File/Folder

Your task was to organize a file/folder by moving one file/folder from one place to another, with a given scenario:

"Now you want to move the animal photos to the 'animal photos' folder. Move 'photo 3' to the new 'animal photos' folder."

How confident are you that you completed this task successfully?

Not at all confident Very Confident

Please rate how difficult the task was.

Very Difficult Very Easy

For the question above, please explain why you gave the rating above.

Did you have any problem while completing this task?

Task8 Delete a Single File

Task 8.

You realize that you don't need the 'test.txt' file anymore in your collection. Delete the file from the Lifetime Library.

- If you have a question about the task, please raise your hand and ask the experimenter.
- If you complete the task, **raise your hand** and inform the experimenter.
- Please don't go back to the previous page or close this window.

you **finished** your task.

- Go to next page only when

Q29-Q32 Delete a Single File

Your task was to delete a file, with a given scenario:

"You realize that you don't need the 'test.txt' file anymore in your collection. Delete the file from the Lifetime Library."

How confident are you that you completed this task successfully?

Not at all confident Very Confident

Please rate how difficult the task was.

Very Difficult



Very Easy



For the question above, please explain why you gave the rating above.

Did you have any problem while completing this task?

Task9 Delete Multiple Files at Once

Task 9.

You realize that you have the same travel photos already stored somewhere on your Lifetime Library. The travel photos are redundant, so you want to delete them. Instead of deleting each file one by one, delete the 4 photos in the 'travel photos' folder all at once, but keep the 'travel photos' folder.

- If you have a question about the task, please raise your hand and ask the experimenter.
- If you complete the task, **raise your hand** and inform the experimenter.
- Please don't go back to the previous page or close this window.

you **finished** your task.

- Go to next page only when

Delete Multiple Files at Once

Your task was to delete a number of files at once, with a given scenario:

"You realize that you have the same travel photos already stored somewhere on your Lifetime Library. The travel photos are redundant, so you want to delete them. Instead of deleting each file one by one, delete the 4 photos in the 'travel photos' folder all at once, but keep the 'travel photos' folder. "

How confident are you that you completed this task successfully?

Not at all Confident



Very Confident



Please rate how difficult the task was.

Very Difficult



Very Easy



For the question above, please explain why you gave the rating above.

Did you have any problem while completing this task?

Q37 Two Likes and Dislikes

From your overall experience today, please describe two things you liked, and two things you disliked in the Lifetime Library web interface in one or two sentences each.

First thing you liked	<input type="text"/>
Second thing you liked	<input type="text"/>
First thing you disliked	<input type="text"/>
Second thing you disliked	<input type="text"/>

Q38 SUS

Last but not least, please complete a very brief survey below about your "overall" experience with the Lifetime Library web interface.

I think that I would like to use this system frequently

Strongly Disagree Strongly Agree

I found the system unnecessarily complex

Strongly Disagree Strongly Agree

I thought the system was easy to use

Strongly Disagree Strongly Agree

I think that I would need the support of a technical person to be able to use this system					
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree
I found the various functions in this system were well integrated					
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree
I thought there was too much inconsistency in this system					
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree
I would imagine that most people would learn to use this system very quickly					
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree
I found the system very cumbersome to use					
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree
I felt very confident using the system					
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree
I needed to learn a lot of things before I could get going					
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree