Assignment M5

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***Abstract*—**The Method (M) assignments for CS-6750 task the creation of thorough plans for performing user research and prototyping interfaces. One complete cycle through the design life cycle for a given task will be realized. The chosen task for these papers is the organization of files, such as structuring of folders and moving files around, within Google Drive. Google Drive is a free file storage cloud-based service developed by Google which allows for synchronization across devices and sharing of files with other users.

1 QUALITATIVE EVALUATION

1.1 Survey

For the qualitative evaluation of the textual prototype, I conducted a survey using the PeerSurvey (peersurvey.cc.gatech.edu) tool. Therefore, my participants were classmates, i.e. Georgia Tech OMSCS students enrolled in CS6750, and they were recruited via the tool and via the Ed Discussion platform. A total of 24 participants took part in the survey. The participants were given a link to read the textual prototype (Appendix 4.1: Textual prototype) and were asked to complete ten follow-up questions (Appendix 4.2: Survey questions).

1.2 Raw results

Of the 24 respondents, 41.7% were in the age group 18 - 29, 41.7% were in the age group 30 - 39, and 16.7% were in the age group 40 - 49. 75% of participants identified as male, and 25% identified as female. As shown in Figure 1, a majority, 62.5%, of participants agreed to some degree with the statement, "I feel very confident in my ability to manage files and folders in Google Drive."

As shown in Figure 2, a majority, 58.4%, of respondents are familiar with the "Column" view feature in the Finder application on Macs; however, a sizable minority are unfamiliar with this feature (either responding "No, but I am familiar with the Mac OS" or "No, and I am unfamiliar with the Mac OS").

To evaluate the prototype itself, participants were asked to rate their agreement

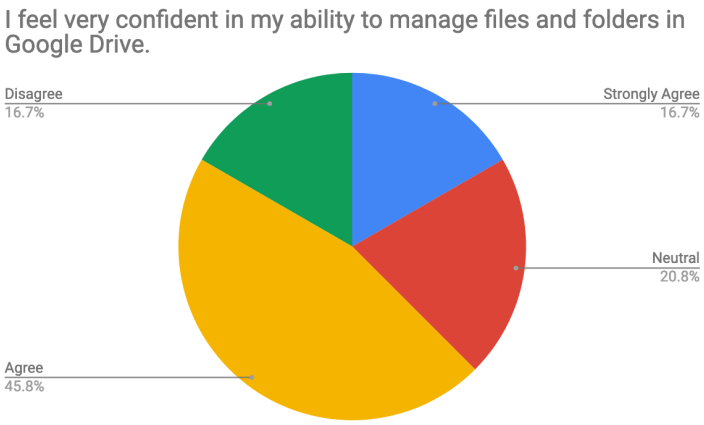

Figure 1—Question #3 responses

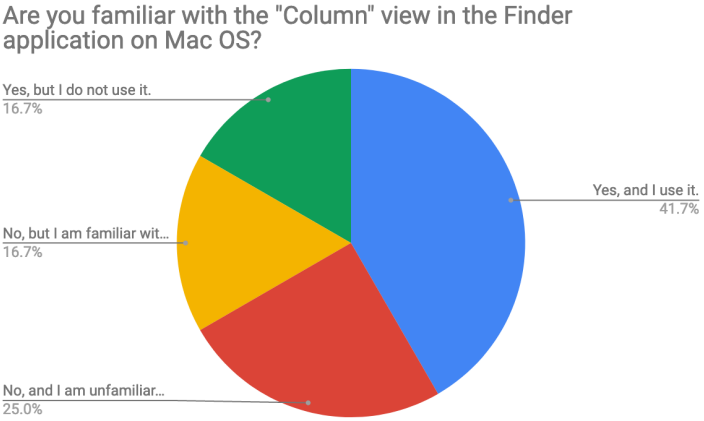

Figure 2—Question #4 responses

with four statements according to the Likert scale. The results can be seen in Figure 3.

Additionally, there were many free-form responses for the two questions asking for additional feedback on the prototype. These can be found along with the comprehensive raw results of the whole survey in Appendix 4.3: Survey responses.

1.3 Analysis

Some of the main takeaways from the survey were:

- For each of the tasks identified (clarity of overview of file tree, ease of navi-

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I feel that having the "Column" view option, as described in the prototype, would give a clearer overview of files and folders in Google Drive.	0	1	6	10	7
I feel that having the "Column" view option in Google Drive would help me more easily navigate files and folders.	0	1	3	13	7
I feel that having the "Column" view option in Google Drive would help me more easily find files and folders.	0	0	4	16	4
I feel that having the "Column" view option, in Google Drive would help me more easily move files and folders.	0	0	7	10	7

Figure 3—Questions #5 - #8 responses

gation, ease of finding files and folders, and ease of moving files and folders), a majority of participants gave the feedback that the "Column" view would improve these tasks over the existing interface.

- Although a high majority of participants consider themselves to be expert users with Google Drive, the participants nonetheless believed that the "Column" view would be an improvement over the existing interface.
- Although a sizable minority, 41.7%, of participants were not previously familiar with the "Column" view feature of the Finder application on Macs, the participants were able to understand it easily through the prototype; in fact, there were only two counts of disagreements with the statements in Figure 3.

I was generally surprised by how positive the feedback was on the prototype. The free-form feedback at the end of the survey provided some further surprising insights including:

- One participant mentioned that they use a workaround for this issue in that they open multiple browsers in order develop a self-made "Column" view on their desktop.
- One participant mentioned a view in Google Drive that I was previously unfamiliar with–a hierarchical view of the folder tree on the left side of the interface.

Feedback received which was expected included:

- A few participants thought that a change to the existing interface could initially be confusing for experienced users.

- Most of the participants of the survey were very confident in their Google Drive abilities. This was expected as the participant sample is from a technically savvy population, i.e. students of a computer science master's program.
- Most participants were familiar with Macs and with the "Column" view in the Finder application; again, this likely due to the high technical experience of the participants.

1.4 Design changes

Some design changes that the feedback would suggest for this prototype are:

- Make this view optional with the existing interface, as a concern was cited by a few participants that this view could be initially confusing for experienced Google Drive users.
- Add an undo button for move operations in the interface.
- The textual prototype should be amended to include a screenshot or GIF of the "Column" view in the Finder application so as to give a better point of reference for those participants unfamiliar with the tool.

2 PREDICTIVE EVALUATION

In this predictive evaluation, the paper prototype is evaluated (Appendix 4.4: Paper prototype) under the lens of two GOMS models. The GOMS models were constructed to address two sub-tasks of the main task: creating files and folders in a specified folder and moving existing files and folders to specified folders (Appendix 4.5: GOMS model task). This task assumes an experienced Google Drive user.

2.1 GOMS models

Figure 4 shows the GOMS model for the first sub-task, and Figure 5 shows the GOMS model for the second sub-task.

2.2 Analysis

Comparing the different methods for the first sub-task (creating a new file or folder in a specified folder) it's clear that significant time is added to complete this sub-task if the user needs to subsequently move the newly created file or folder to the specified folder. This could potentially made more efficient by adding an option in the dialog in which the user could pre-select the specified

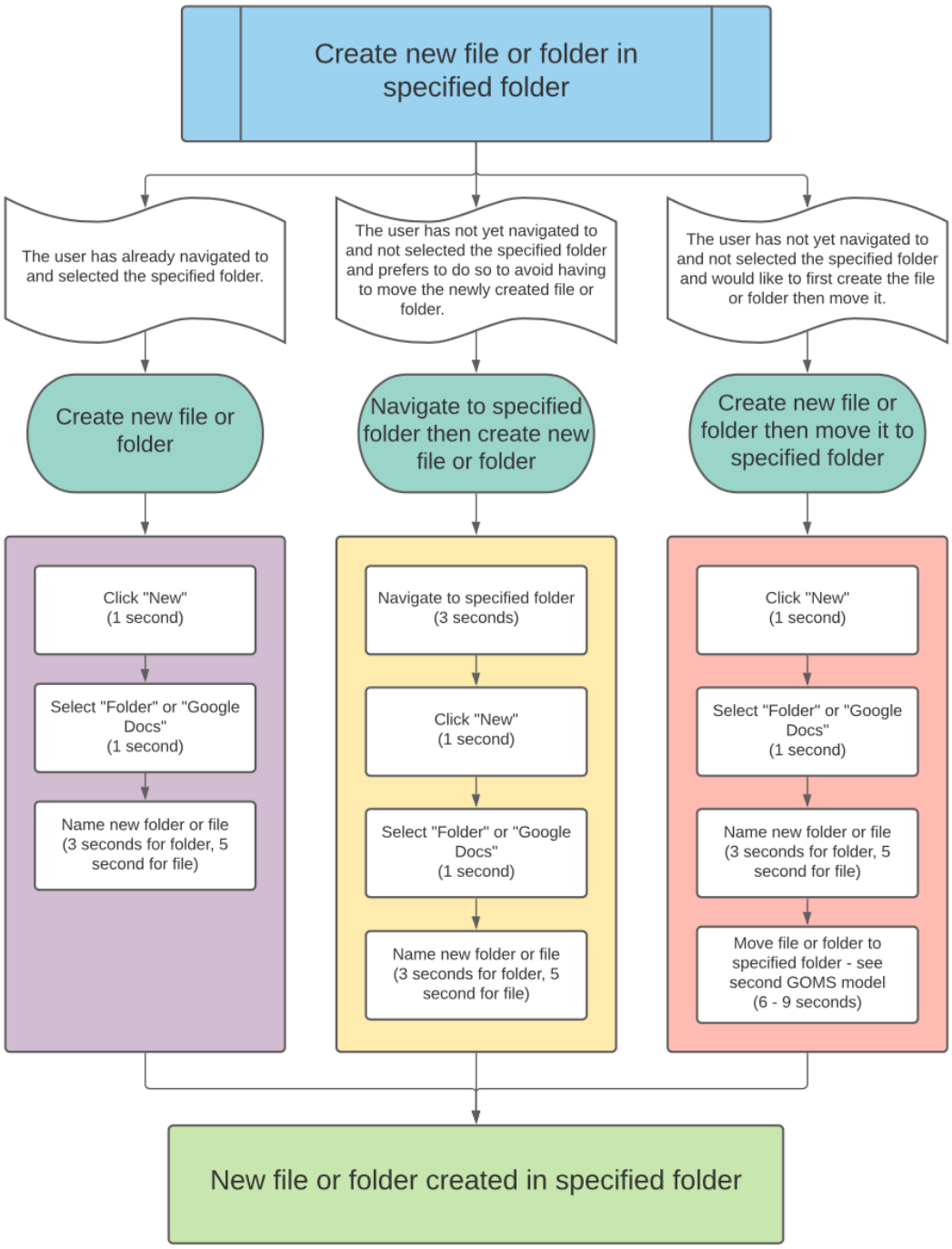

Figure 4—GOMS model for first sub-task

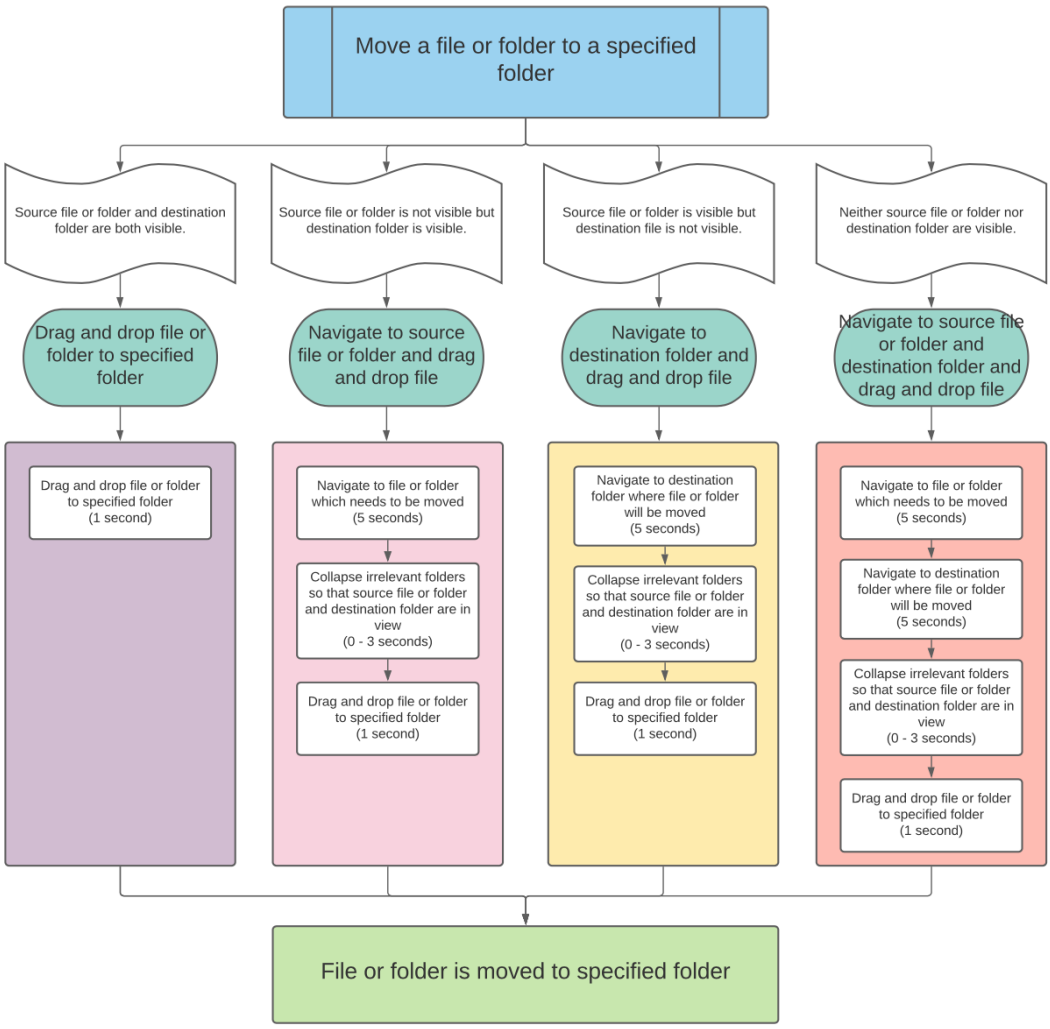

Figure 5—GOMS model for second sub-task

folder; however, I don't think this will result in a significant speed-up. Another idea would be creating a more efficient way to keep newly created files and folders visible in order to increase the efficiency of the subsequent moving task. For example, this might mimic the interface feature on Macs in which screenshots remain visible on the screen for several seconds after the screenshot is taken so that is is easier to move. However, a trade-off here might be that this would clutter the interface for users who use one of the other methods for this sub-task.

For the second sub-task (moving a file or folder to a specified folder) the methods which lead to less efficiency are the ones in which the specified file or folder or the destination folder are not visible. These methods necessitate operators which involve manual navigation to files and folders. This could be made more efficient by adding a hot key as an available operator to quickly open the view of a file or folder. This could, for instance, be similar to the Github interface hot key "t" which allows a user to quickly select a file. A trade-off of this feature, however, is that it might not be immediately discoverable to users.

3 EVALUATION SUMMARY

In this section, I will describe what I would do in the next iteration through the design life cycle.

3.1 Future needfinding

An interesting disparity was observed between initial needfinding and the qualitative evaluation of the prototype. While the initial needfinding indicated that survey participants did not have difficulties with the interface, the subsequent qualitative evaluation in the form of the survey of the textual prototype indicated that participants saw room for improvement with the interface and were positive about the feasibility of the prototype. In a future round of needfinding, I would ideally do interviews with such individuals who reported not experiencing difficulty with the existing interface but saw improvements with the prototype. I would want to further understand what exactly about the prototype they considered to be an improvement.

3.2 Design alternatives

An all-new design I would like to create is one which implements tiling such as in a tiling window manager. In a tiling window manager, the screen can

be customized and divided into non-overlapping frames. This would allow for multiple frames in which a user could move around files and folders, such that they would be constrained to the given path in the tree of the selected file or folder, as is the case in the "Column" view prototype. This was inspired by a participant in the prototype evaluation survey which gave the feedback that having multiple windows is most helpful when moving around files and folders.

3.3 Prototype revisions

Interestingly, through the first design life cycle, I discovered myself more features of the Google Drive interface which I previously had not known about. For example, I never knew that there was an additional view of the folder hierarchy on the left side of the interface. I think this could thus be leveraged and integrated with the design of the paper prototype to support the additional features of the paper prototype.

I would like to make this change and also potentially integrate gestures and hot keys which could be used to more quickly navigate the file tree. As evidenced by the GOMS models, it seems that manually clicking around slows down the efficiency of the interface, so these gestures and hot keys could improve efficiency. With these changes in mind, I would then proceed to a higher fidelity such as more sophisticated wireframe with multiple views with which the user could interact.

3.4 Future evaluation

The next prototypes are likely still not ready for a true empirical evaluation. The next evaluation would still be focused on qualities and predictive evaluations to determine whether the initial intended improvements are indeed improvements. I would ideally do some think-aloud and post-event protocols. Should these be received positively, then I would move onto creating functional prototypes.

4 APPENDICES

4.1 Textual prototype

When using a hierarchy of files and folders in Google Drive, it is challenging for a user to simultaneously remain in a child folder and see the content of parent folders. This can be especially important when a user wants to organize their files and move certain files and folders to a different location in their drive.

In the current Google Drive interface, when a user is in a folder, they can only see the files and folders within that folder. There is a path displayed at the top of the interface; however, there are two significant disadvantages with this display. Firstly, it is not very prominent for the user. Secondly, this path is truncated to only include "My Drive" (which is the root directory) and the parent and grandparent folders when the currently viewed folder is at least five levels deep in the folder tree.

Let's suppose we have a Google Drive user, Mary, who is a zoologist. She uses Google Drive professionally in her job at a zoo and creates documents for each type of animal in the zoo; therefore, she has a root directory named "Animals" which contains the folders "Vertebrates" and "Invertebrates". Within the "Vertebrates" folder, she has the folders "Warm-blooded" and "Cold-blooded". Within the "Warm-blooded" folder, she has the folders "Mammals" and "Birds". And within "Mammals", she has the documents, e.g., "Lions", "Tigers", and "Bears". At this folder in her file system, she is five levels away from the root directory, "Animals". Now, Mary is a skilled zoologist, but she occasionally misclassifies some animals. Unfortunately, in the current Google Drive interface, it is not possible for her to quickly see the contents of the parent, grandparent, etc., levels.

The alternative design of the Google Drive interface, proposes building in column panels to the interface much the way they exist in the Finder application on Macs. In this design, when the user navigates to child folders, the parent folders are still displayed, one column per level in the tree. It is possible to see all the contents for each level in the path when navigating deeper in the tree.

With this alternative design, Mary is offered a more comprehensive view of the detailed taxonomy of her animal classifications; she is no longer limited to only seeing the contents of the folder she is currently viewing. In this way, she can more easily understand where she is in the classification tree at any given time and can move files easily to other folders in the tree.

4.2 Survey questions

1. **Select your age group:**
   - ☐ Under 18
   - ☐ 18-29
   - ☐ 30-39
   - ☐ 40-49
   - ☐ 50-64
   - ☐ 65+
2. **Which gender do you identify with?**
   - ☐ Female
   - ☐ Male
   - ☐ Other
3. **Please rate your agreement level with the following statement: I feel very confident in my ability to manage files and folders in Google Drive.**

   Strongly disagree ☐—☐—☐—☐—☐ Strongly agree
4. **Are you familiar with the "Column"view in the Finder application on Mac OS?**
   - ☐ Yes, and I use it.
   - ☐ Yes, but I do not use it.
   - ☐ No, but I am familiar with the Mac OS.
   - ☐ No, and I am unfamiliar with the Mac OS.
5. **Please rate the following statement: I feel that having the "Column"view option, as described in the prototype, would give a clearer overview of files and folders in Google Drive.**

   Strongly disagree ☐—☐—☐—☐—☐ Strongly agree
6. **Please rate the following statement: I feel that having the "Column"view option in Google Drive would help me more easily navigate files and folders.**

   Strongly disagree ☐—☐—☐—☐—☐ Strongly agree
7. **Please rate the following statement: I feel that having the "Column"view option in Google Drive would help me more easily find files and folders.**

   Strongly disagree ☐—☐—☐—☐—☐ Strongly agree
8. **Please rate the following statement: I feel that having the "Column"view option, in Google Drive would help me more easily move files and folders.**

   Strongly disagree ☐—☐—☐—☐—☐ Strongly agree
9. **If you disagreed with any of the above statements, what were your reasons? (Optional)**

   _____

   _____
10. **Do you have any additional feedback on this prototype? (Optional)**

    _____

    _____

Figure 6—Survey questions

4.3 Survey responses

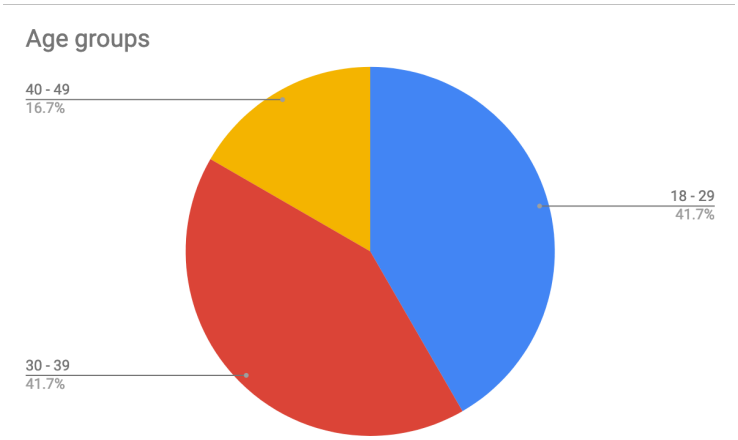

Figure 7—Question #1

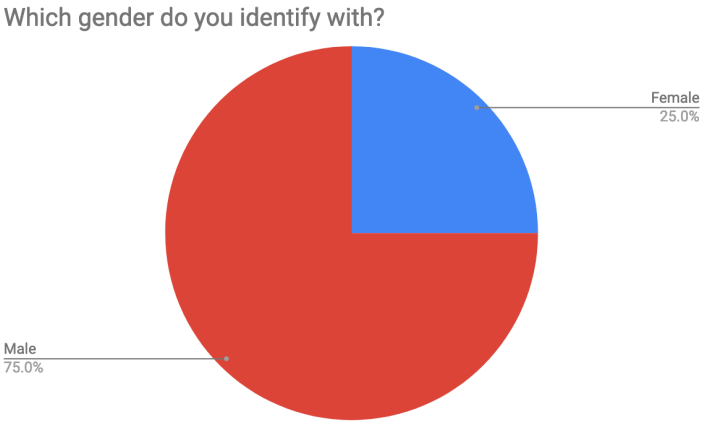

Figure 8—Question #2

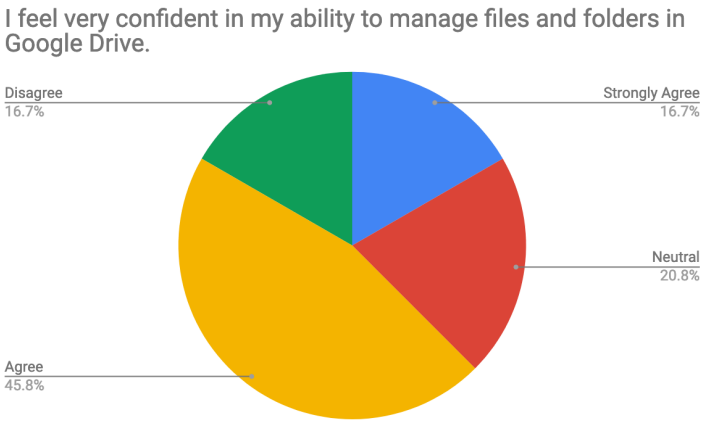

Figure 9—Question #3

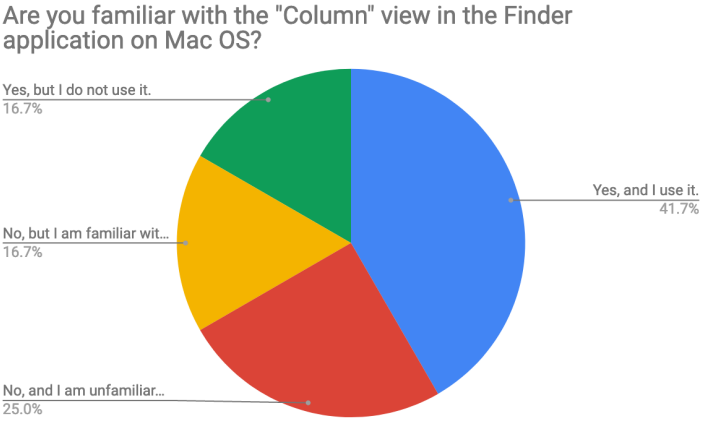

Figure 10—Question #4

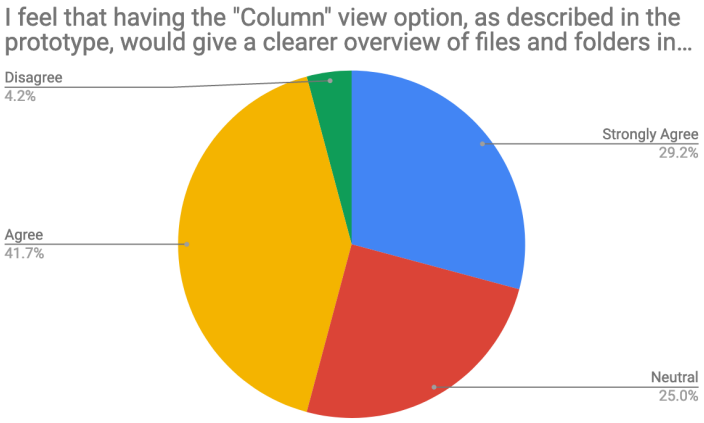

Figure 11—Question #5

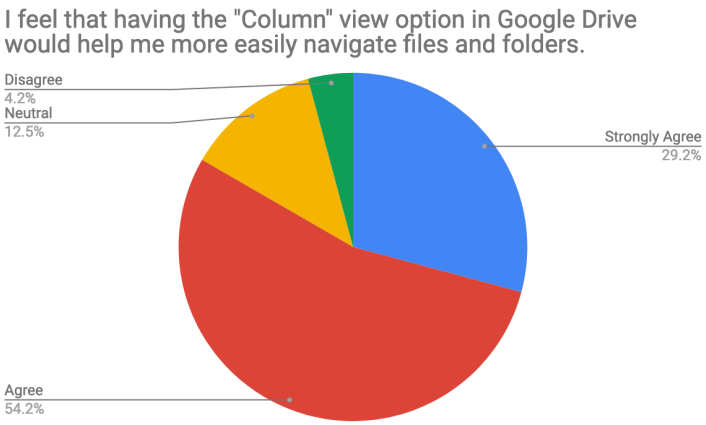

Figure 12—Question #6

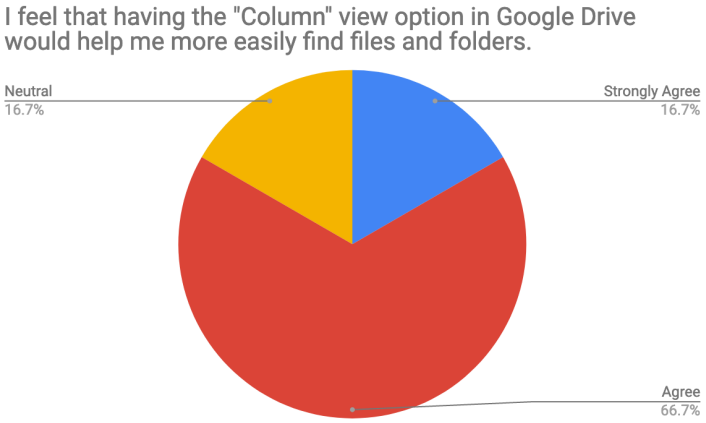

Figure 13—Question #7

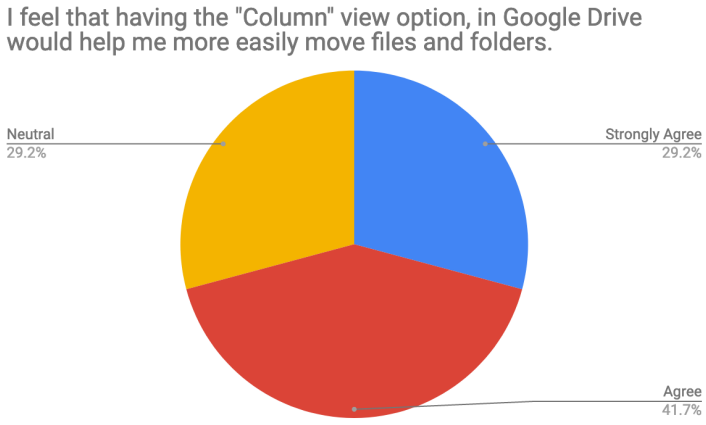

Figure 14—Question #8

4.3.1 *Question #9: If you disagreed with any of the above statements, what were your reasons?*

- "I did not"
- "You didn't mention the context in which this new prototype would be used, but if this is for desktop (large screen size) then I think this would be great. On the other hand, I think this would hurt the mobile experience depending on how it was implemented."
- "I think having columns could be more confusing initially compared to the current Google Drive interface."
- "Sometimes I have two Finders open to move items in Mac"

4.3.2 *Question #10: Do you have any additional feedback on this prototype?*

- "I hesitated at the moving files with the column view. I am familiar with Google Drive and I can image the Column view idea. I would like an undo option if I screw up moving something."
- "It would have been helpful to have seen a visual depiction of what a mac os column view looks like to give me an idea of how i can envision this in google drive"
- "It would have been informative to include screenshots of the Finder application in the prototype for those not familiar with the Column layout"
- "I do not"
- "I'm able to navigate on the left side of Google drive to see sub-directories. I think that's the columnar view you are referring to but I'm not sure. Either way its still helpful."
- "I'm not very familiar with "column view" on Mac OS. I don't really used Mac OS in my day-to-day. However, I have a good understanding of what it is, and I know I would benefit from that kind of organization / view in my google drive environment. That being said, it might be helpful to include an image reference in the next survey to help get everyone one the same page. Just a thought."
- "This would be a great implementation for Google Drive! I always feel like the icon layout the list layout weren't letting me find the files I needed, and everything is jumbled up and sorted by date. Since I use Google Drive to save family photos, I want the ability to easily navigate between the different folders, despite them being years/months apart."

- "Not really feedback, but a question? How would Mary use this column view in the field if she needs to interact with documents?"

4.4 Paper prototype

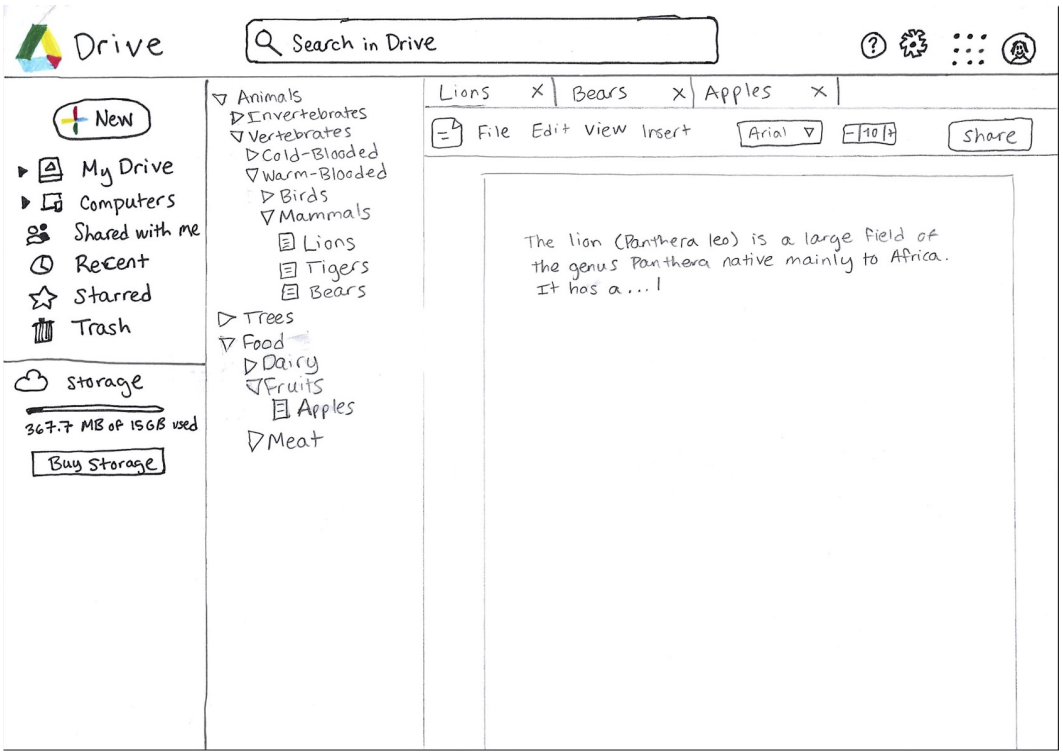

Figure 15—Paper prototype

4.5 GOMS model task

The task for this evaluation will be similar to the task which was used for the think-aloud protocol. There are two parts to this task:

1. Create and name the folders and files (blank Google documents) according to the hierarchy presented in Figure 3. Note that the rectangle icon represents a folder and the "multiple documents" icon represents a file.
2. Rearrange the folders and files according to Figure 4.

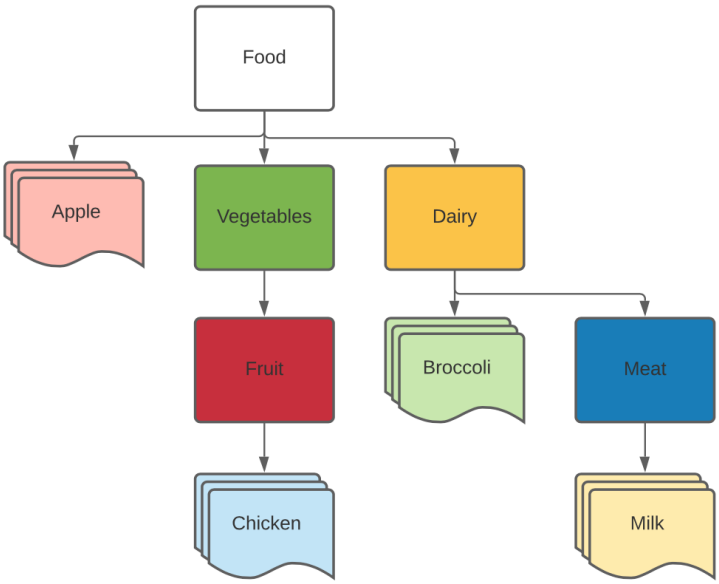

Figure 16—Task # 1

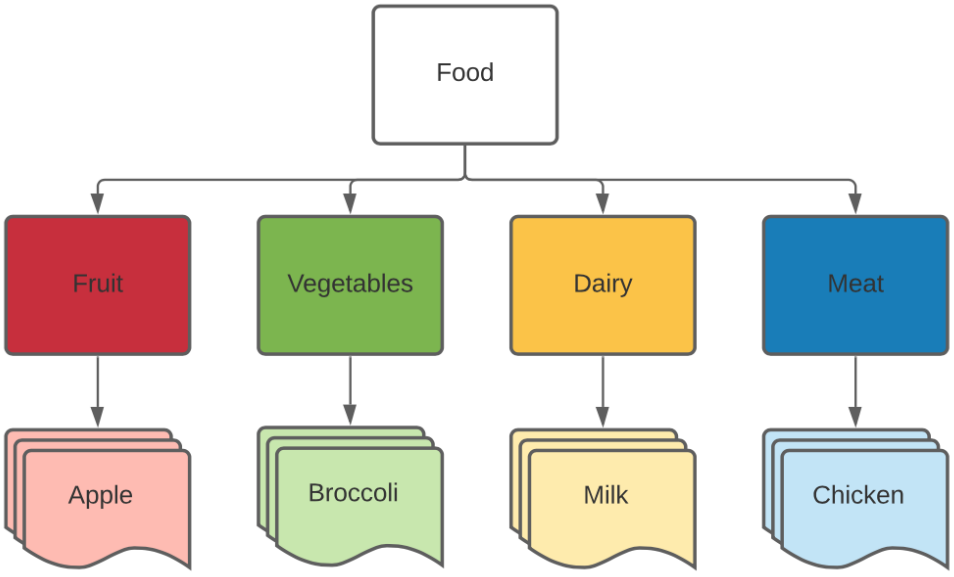

Figure 17—Task # 2