

Final Project

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1 DESCRIPTION

The interface selected for this project is Google Drive Web App. This is a popular cloud-based product which has been widely applied for home, business and beyond. User can access Google Drive through Gmail account. Once a Gmail account is created and linked to Google Drive, user can perform different types of tasks on this interface.

Firstly, user can store and backup files on Google Drive. This interface allows user to directly upload files from a local device. A personal account saves up to 15 GB of files for free. User can easily access or download all the saved files by logging into one's Google Drive account regardless of devices. The upload and download speed are very fast and service is compatible among a wide range of devices (such as laptops, desktops, phones, tablets, etc.).

Secondly, Google Drive allows user to create various types of files on this cloud drive, such as Google doc, sheet, slide, form, etc. These files can be synchronized across devices, which enables remote team collaborations. If user needs to collaborate with different people on a file, s/he can invite them by simply clicking few buttons through 'sharing' feature. User can also control other's level of access by choosing between 'can edit', 'can view', 'can comment' options. Once others obtain the right of editing, they can collaborate with user synchronously. All the edits are automatically saved.

Moreover, this interface enables user to organize files into folders in a customized way. It has drag and drop features, allowing users to easily move files or folders around. User can also share folders to others with controlled access level.

In general, Google Drive is easy to use and fast to learn because it well aligns with standards in other interfaces and resembles user experience of desktop applications. Despite all these advantages, using Google Drive could be frustrating sometimes. For example, this interface heavily relies on internet. Once user loses internet connection, s/he cannot have access to any file on this interface. This project was firstly aimed to investigate current frustrations that users are facing

when they use Google Drive. One pain point that fits the scope of this work would be selected, analyzed, and redesigned.

2 INITIAL NEEDFINDING

The first need finding plan (product review) was mainly aimed to understand current frustrations faced by Google Drive users. Problem space was scoped based on findings from this need finding study. User types, motivations, tasks and needs were also qualitatively analyzed.

The second need finding plan (survey) was aimed to validate and/or rescope the problem space identified from previous product review analyses. Demographic and behavioral questions were also surveyed.

The finalized problem space, data inventory, and interface requirements were summarized in conclusion part based on results from both need finding studies.

2.1 Need finding 1 – product review

[G2 website](#) was applied for this product review need finding study. Google Drive had a high rating (~4.5/5) based on over 9500 reviews. This indicates its popularity and overall good usability. **Users** of Google Drive came from a wide range of industries including school, government, global small, mid and large size companies, etc. They had diverse occupations such as analyst, administrator, consultant, HR rep, scientist, student etc. Their **tasks** fell into 3 major categories: storage/back-up, team collaboration, and file sharing.

Despite the general positive feedbacks of Google Drive, users still experienced some issues with current design, which negatively impacted the overall usability of this interface. Researcher mainly focused on the reviews with rating of 3 and below for **user frustration/problem space exploration**. The most common complaint was about limited free storage for personal usage. Technical-related complaints were also mentioned very often, such as ‘not really auto saving’, ‘does not properly back up’, ‘often times crashes’, ‘file can't be uploaded’, ‘syncing errors’, ‘connection issues’, etc. Although all these issues were critical to user experiences, their fixations are almost impossible to be achieved simply by interface redesign and were considered beyond the scope of this project.

Another dissatisfaction mentioned many times in the review was about the **difficulty to efficiently retrieve documents on Google Drive**. Representative user reviews were demonstrated in Figure 1. Retrieval of saved files is a routine task on the interface. Currently, inefficiency design could largely reduce productivity and increase turnaround time. Moreover, this problem was more likely to be addressed by interface redesign and was tentatively selected as problem space for this project at the end of the first need finding study.

Observer **bias** could be a significant issue in this study. To control its effect, findings from this study would be validated and confirmed through survey in the next need finding study.

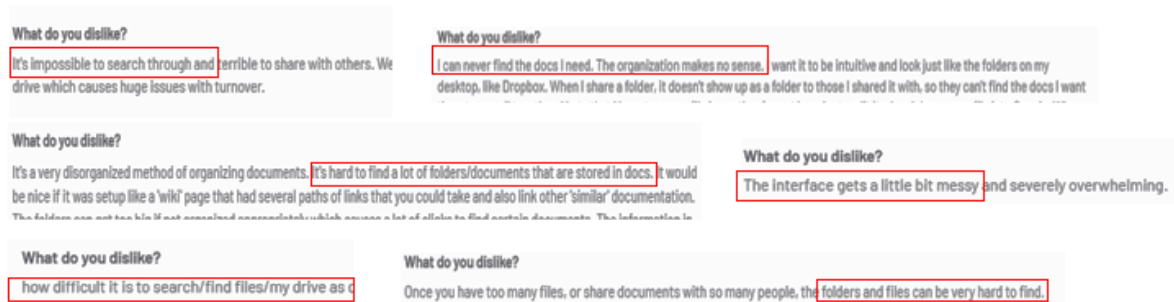


Figure 1— User complaints about finding files on Google Drive

2.2 Need finding plan 2 – survey

Survey was applied in the second need-finding study. It was aimed to validate and further understand **problem scope** in this project which was user's frustration about finding files on Google Drive. User's demographics, motivations, current behaviors, and tasks were also analyzed for data inventory. Survey was created by using PeerSurvey and posted on Piazza for participant recruitment. Details about survey question were listed in Appendix. Thirty GT-students participated in this survey, but 1 respondent was removed before data analysis since s/he did not meet the recruitment criteria of (a) ages 18 and above; (b) use Google Drive sometimes or more frequent. Therefore, a total of 29 qualified responses were obtained. Their demographic information was in Appendix.

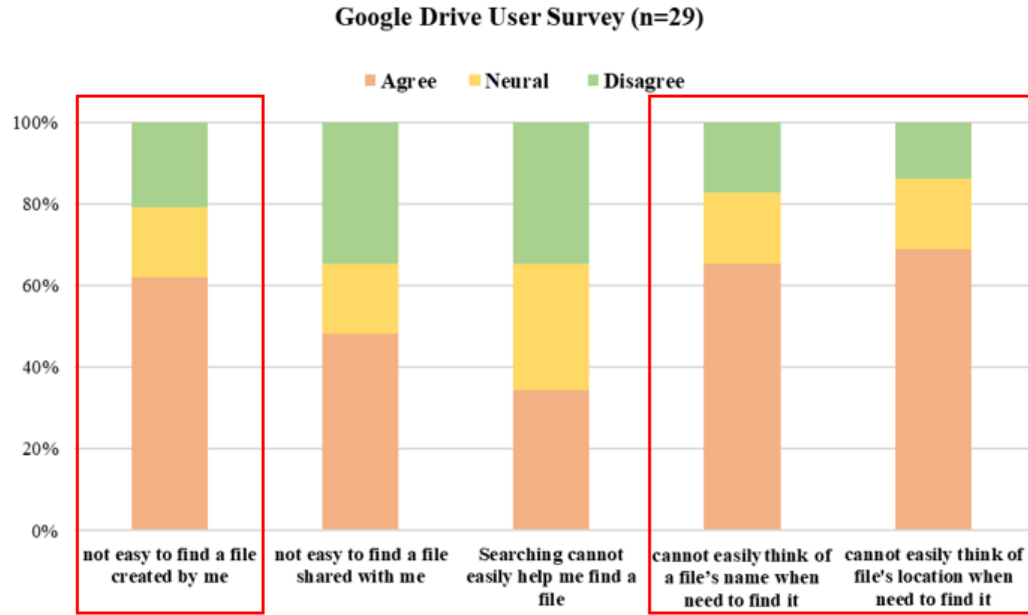


Figure 2 — Survey results about user experience with finding files on Google Drive

Respondents were required to rate their extent of agreement to 5 statements relevant to difficulties about finding files on Google Drive. Results were listed in Figure 2. In general, majority of respondents (>60%) more or less agreed that current design of Google Drive interface generated uneasiness for them to find files, especially the ones created by themselves. This frustration was caused by 'cannot easily think of a files name', 'location' etc. User's attitudes towards the usability of searching feature in file finding were about equally split among three categories and ~35% respondents considered searching feature alone was not enough for this task.

Figure 3 shows user's current behaviors for file searching on Google Drive. Common approaches were 'by key words' and 'go through folders'. Based on user's attitudes in Figure 2, these methods were not effective enough for user to complete the task easily and efficiently.

Researcher proposed to add filtering feature on Google Drive to supplement current approaches for file finding. User's opinions about this addition were surveyed and results were in Appendix. In general, none of respondents expressed

disliking of this new feature. They preferred to filter files mainly by 'last edit date', 'owner's name' and 'file type'.

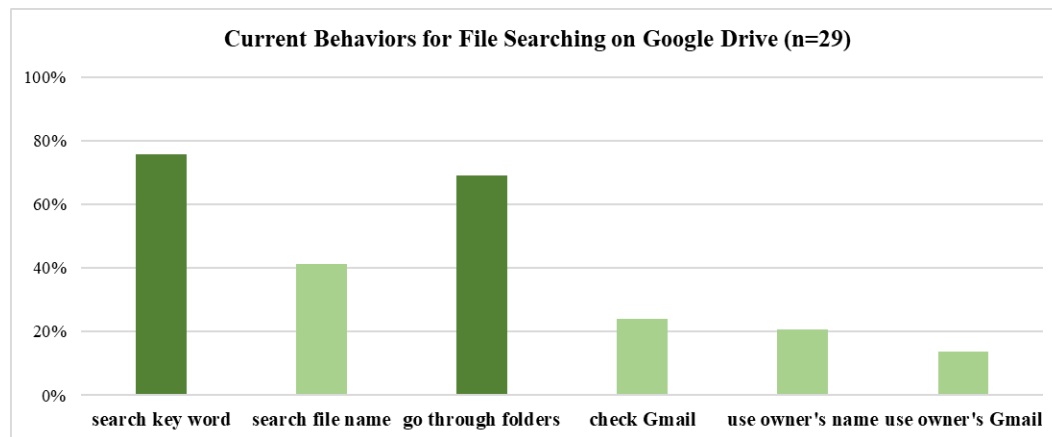


Figure 3 — Current user behaviors for file searching

To control **biases**, the survey questionnaire was reviewed by two different people before test. Leading and potential leading question were rephrased. Potential respondents were only notified that this survey was relevant to Google Drive Web. No more details (such as experience about file finding) were revealed.

2.3 Conclusion

Problem space. Need finding studies proved that Google Drive users felt frustrated about current design for files retrieval (esp. for My Drive). This issue could arise when user needs to find a specific file from massive number of documents stored on Google Drive. To complete this, user has to at least loosely remember certain information about the file and use it as key word for searching, which creates a lot of cognitive burdens. In the absence of file information, user may have to go through individual folders to find a document, which significantly reduces work efficiency and productiveness. Therefore, finding a file on Google Drive could be cumbersome and frustrating sometimes. To mitigate this issue, researcher aimed to redesign the file finding process for Google Drive.

Data inventory

Users, motivations, and goals. Google drive has very diverse user groups in various industries. They age 18 years and above, can be either light or heavy users. They rely on Google Drive for home, business, and study tasks including storage, filing sharing, team collaboration, etc.

User needs. Focused on file searching specially, user needs more effective approaches to help them quickly and easily find files from massive number of documents on Google drive. Currently, they mainly rely on key word searching and folder checking, which could be slow and difficult in many cases.

Tasks and subtask. The major task is to efficiently find a desired file from Google Drive. This can be broken down to 1) label a file using key information (name, owner, type, storage location) once receive it, 2) retrieve its label when need to find it, 3) use retrieved label information to filter/sort/locate the file.

Requirements. The key requirement is to reduce user's cognitive burden and memory load for file finding task. Recognition will be applied to help user find the desired file in a more simple and faster manner.

- Filtering features will be added to improve current file finding approach
- User can use this new feature and traditional approach(es) individually or together.
- User can filter files by various methods (such as creation date, last edit date, file type, owner, tags).

3 HEURISTIC EVALUATION

3.1 Consistency

Google Drive provides user with consistent experience to laptop and other widely used interfaces. It effectively leverages user's mental model developed from past laptop usage experience. This largely narrows the gulf of execution and fastens learning process.

Firstly, Google doc, spreadsheets, and slides features resemble Microsoft Office functionality very well. People who are familiar with Microsoft Office products can pick up this interface very fast based on existing mental model. In addition, this interface allows using many common shortcuts and has various features supporting routine tasks as Microsoft Office products do, such as check spells and grammars, perform simple calculation using built-in formulas, add comments and track editing changes, etc. Moreover, file organization tasks on Google Drive generally mirror the processes on laptop device. User can create folders with customized name and easily drag files to desired folders. User can find files

by searching key words. Once user deletes a file, it will be temporarily stored in Trash. User can further decide whether to restore or permanently delete it.

3.2 Feedback and feedforward

Google Drive interface has rich feedbacks and/or feedforwards at nearly every step of execution and evaluation. Signifiers are incorporated intuitively. Using Figure 4 as an example, which is the first screen presented to user once s/he logs onto this interface. There is a large search bar on the top with grey text of 'Search in Drive' telling user the task one can perform with it. A colorful 'plus' sign button with 'New' text is on the top left. User can easily understand where to go for new creation. All the files on Google Drive are present in the center. Quick access predicts what files user may want to access based on one's recent behaviors. All the folders are listed below Quick Access with current view for folder presentation listed by text ('Name') and arrow button (up/ascending). This interface also differentiates private folders from shared ones by adding a person icon to the folder icon. At the bottom left, storage usage is visualized by a progress bar and explicitly explained by numbers.

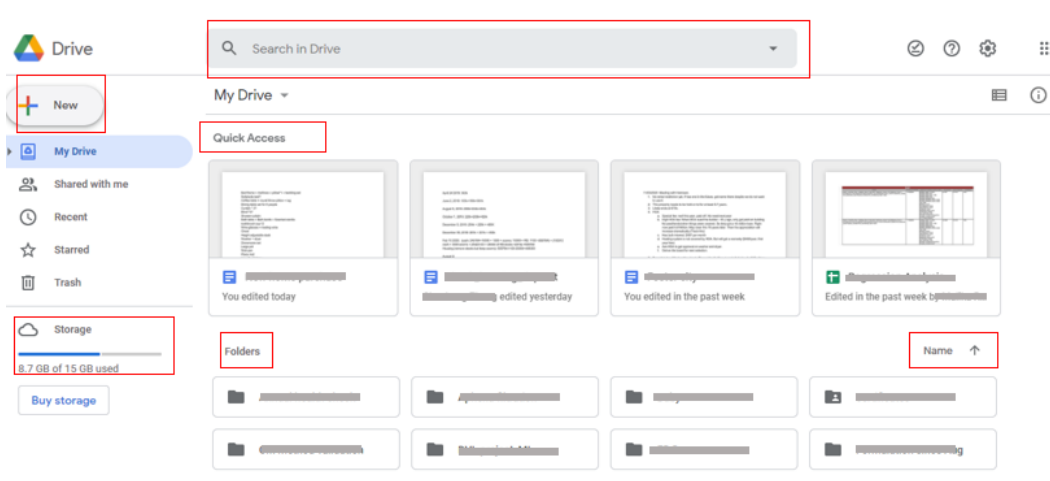


Figure 4— First screen of Google Drive after login

3.3 Tolerance

This interface is tolerant to user mistakes. User can easily undo or redo to correct previous mistakes. For example, user accidentally deletes a file. A text will pop out at the bottom, saying 'File moved to Trash' with a highlighted clickable 'UNDO'

button. User can easily click on 'Undo' to recover this mistake. In the situation where user needs to go through folders to find a file, one can easily go back and forth by using the top ← → buttons if s/he mistakenly clicks on wrong ones.

3.4 Structure

Unfortunately, Google drive lacks architecture design that helps user manage and organize random files in an effective and meaningful way. On its main screen (Figure 4), all the unarchived files are listed below folders alphabetically. This design is manageable when only a small amount of files are in storage. When the storage gradually builds up, this presentation could become very messy and cluttered. Currently, there is no feature allowing user to filter or sort these unorganized/random files from main screen directly. If user wants to check what files are stored on drive, s/he has to scroll all the way down to bottom and looks through individual files simultaneously.

3.5 Flexibility and Ease

Google drive is also lack of flexibility and easy-to-use in certain areas. Firstly, user has to hold a Gmail account for its services. This is understandable from a business perspective, but could appear inflexible and inaccessible to some users. Secondly, its current design creates difficulty in file finding process. Searching is a key feature to address this need, but user cannot always accurately recall the relevant information. In this case, user may have to go through the whole drive, which is extremely time-consuming and unproductive. Its current design misses some useful features that could help user recognize or even remember what they may want. It also fails to minimize the complexity of the file finding process and to take over majority of cognitive activities from user's cognitive resources in this situation.

3.6 Perceptibility

As a heavy Google Drive user with more than 3 yr usage experience, researcher did not notice the existence of an advanced search option on Google Drive until this heuristic evaluation. Researcher stumbled on this by an accident click, which further proved the lack of perceptibility of this advanced search option (Figure 5). This could result from three aspects. Firstly, the button activating advanced search option locates on the right side where most people tend to pay less visual attention. Secondly, the color choice (light gray) fails to make this button more

noticeable. Thirdly, the choice of signifier (down-arrow) does not make the most sense since there is not much sensible connection between 'down-arrow' and 'advanced search'.

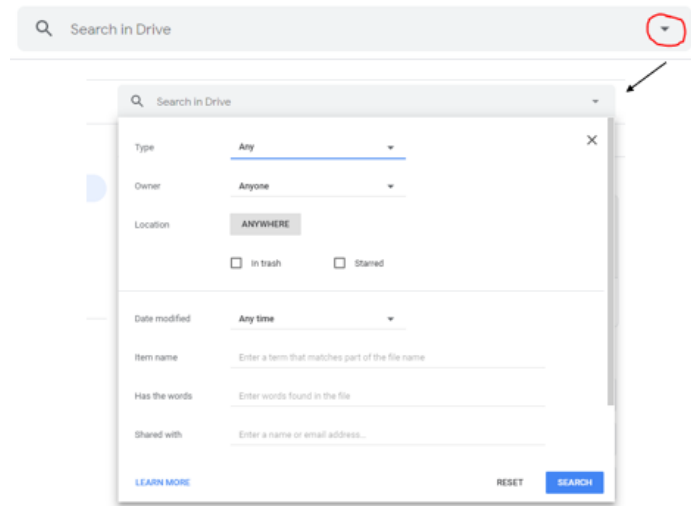


Figure 5— Advanced searching option

4 INTERFACE REDESIGN

A total of 14 wireframes was created by using Balsamiq cloud. Only 7 screens are demonstrated in the main body due to the space limitation. The rest of screens with detailed navigation flows are in Appendix.

4.1 Rearrange the layout of main screen

Figure 6 shows the redesigned main screen which will be the first screen presented to user once s/he logs in. There are 3 major changes. Firstly, 'advanced search' option is highlighted below the search box. Its navigation flow is in Appendix. Secondly, the display of folders and files are removed from the main screen and replaced by menu tabs. Thirdly, a more flexible display for Quick Access is enabled.

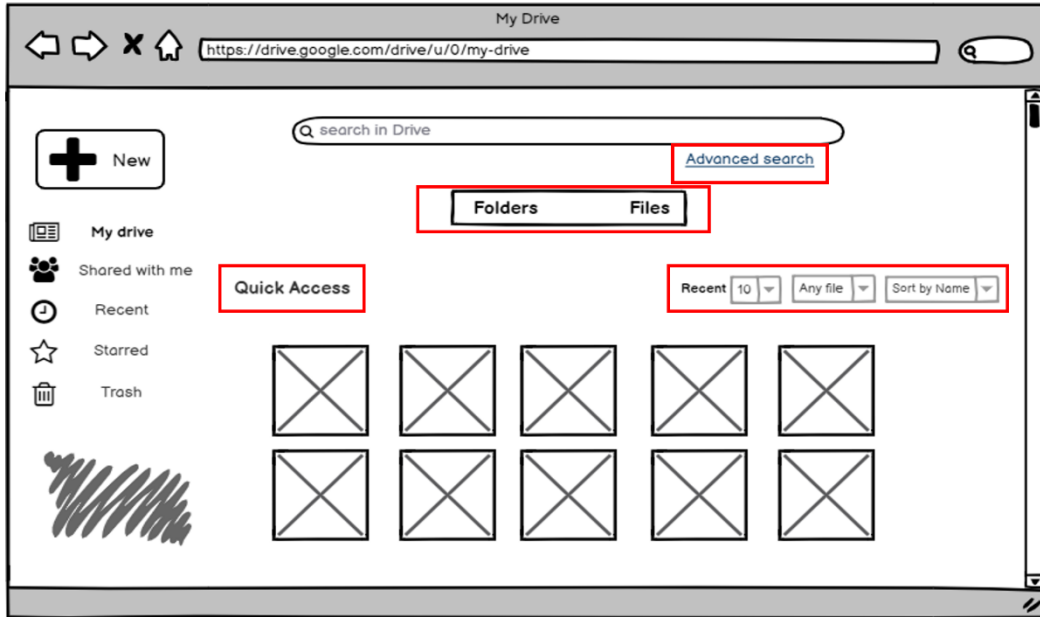


Figure 6— Main screen redesign for Google Drive

4.2 Redesign quick access

A more flexible Quick Access is developed so that user can determine the number and types of files to display in which order. The navigation flow for changing this setup is listed in Figure 7. A more legible version is in Appendix.

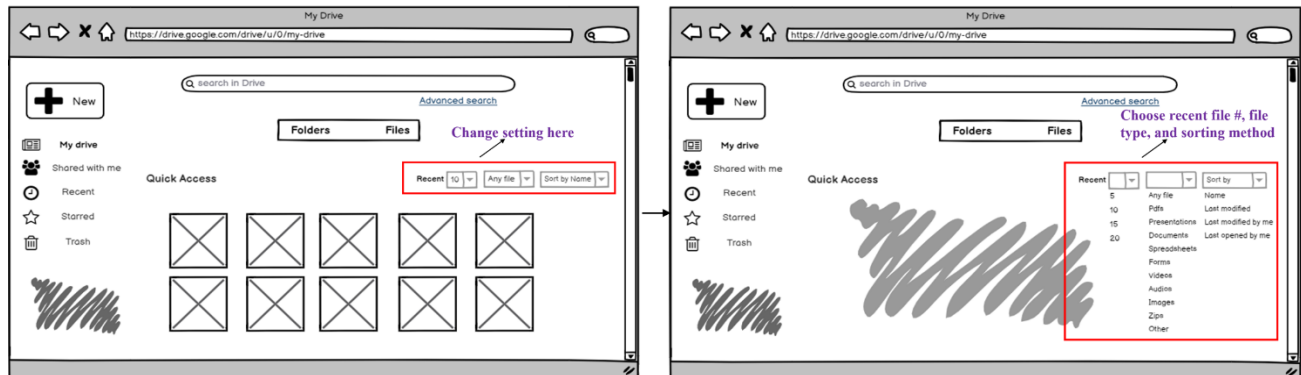


Figure 7— Quick Access redesign for Google Drive

4.3 Filter folders

The redesigned interface allows user to filter folders by a) type of file contained in the folder, b) creator or editor, c) date last modified, d) date created, e) tags.

Tag is a unique filter feature. User can either type the tags based on memory or simply recognizes all applicable tags automatically generated by the system. This design assumes user or system has created tags for individual files / folders at the creation or uploading stage.

Once the filtering is complete, user can easily reset or remove the filters (appendix). A full flow diagram of this task is listed in Appendix.

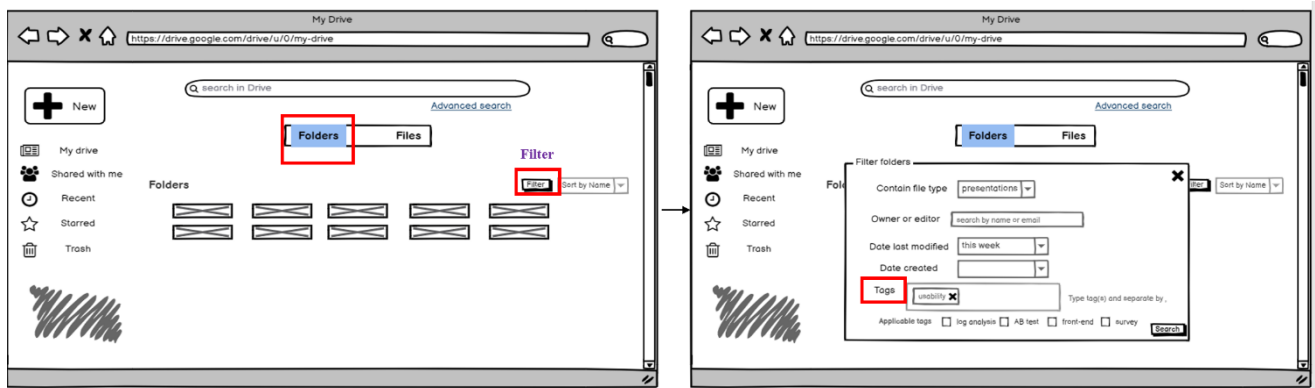


Figure 8— Filter folders on My Drive

4.4 Filter files

Similar approach is also applied for file filtering and present in Figure 9. A full version of this navigation flow is in Appendix.

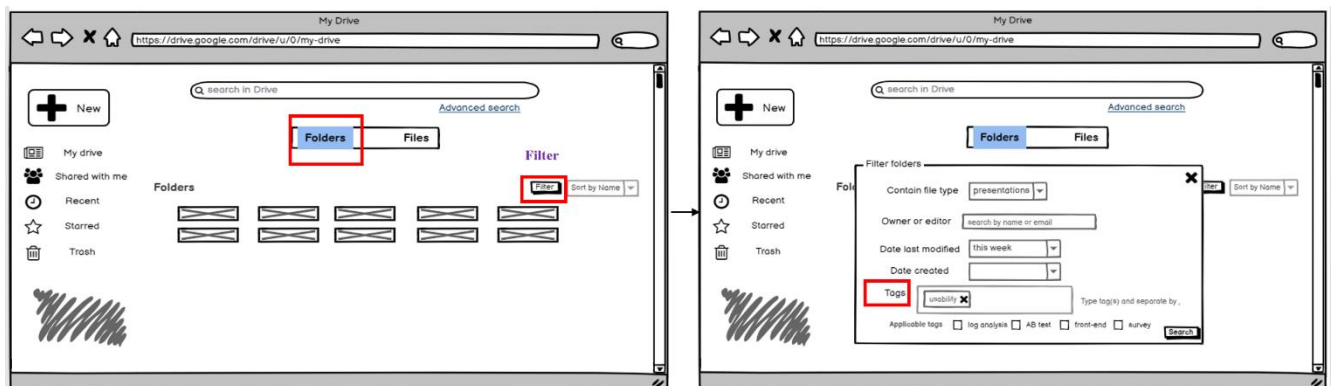


Figure 9— Filter files on My Drive

5 INTERFACE JUSTIFICATION

5.1 How the criticisms are addressed

Simplicity and Efficiency of use are the two key principles leveraged in the interface redesign to address the issues mentioned in heuristic evaluation.

In the current design, folders and files are displayed below Quick Access in alphabetic order. This display (esp. for files) could become cluttered when a large number of documents are stored on Google Drive. This further creates issues in physical file finding process. In the redesign, only Quick Access is present on the main screen. Files and folders are replaced by menu tabs. If user wants to look at files or folder, s/he only needs to click the corresponding tab to change the view. This follows the minimalism concept to ensure a clean look of main screen while preserving all the required features.

User control and freedom are magnified in this redesign. The goal is to provide user with very flexible and effective experiences. For example, originally only 4 files are present in Quick Access regardless of file type. In the redesign, the default file number in Quick Access file is increased from 4 to 10. In addition, user can choose the number and types of files to display in Quick Access. Say user can retrieve the recent 25 presentation files by clicking 2 buttons at Quick Access. This offers user a fast and simple alternative way to access the most recent documents as desired.

Users have complaint about the challenges in finding files on Google Drive in need finding studies. This could result from the difficulties in recall of file name and location. To mitigate this issue, redesign proposed a supplement approach that enables user to filter files and folders based on loose memory. This filter button locates on the right side of screen next to 'sort'. Once it is clicked, the interface will be navigated to a new screen where user can input filter parameters of a) file types, b) owner or editor's name or email, c) date last modified, d) date created, or e) tags. These filter methods are designed and prioritized based on need finding survey results. This offers user an effective way to quickly go through folders or files. In the scenario where keyword searching fails to return file correctly, this alternative becomes useful. Instead of going through all the folders (indicated in need finding study), user can apply desired filters on either folder or files. This would save user significant amount of time and effort.

Recognition is also applied as part of filtering process. A strong weakness in current design for file finding is that user has to remember some level of information about a file. This is not usable when user fails to memorize anything applicable. To mitigate this problem, a unique feature 'tag' is added to this whole interface. Hypothetically, tag(s) have been generated by user and/or system for every single files and folders at creation or uploading stage. In this scenario, tag becomes an extremely useful filtering feature. On the filter feature setup screen, all the applicable tags for files or folders are automatically present as 'applicable tags'. Thus, user only needs to select the tags associated with the file of interest. These tags can be considered as substitute of keyword. The major difference is that tags rely on recognition while keywords require memorization. Addition of tag feature enables user to distribute their long-term memory to the interface, which largely reduces the cognitive burden on user's mind.

Error prevention principle is also incorporated in the redesign. After user filters files or folders, all the applied filters are listed at the center. User can easily remove individual filter by click on its cross button or remove all of them at once by choosing 'Reset'. This design enables user to easily correct previous mistakes.

Last but not least, perceptibility of interface is improved by using a more reasonable **mapping**. Instead of using 'down-arrow' button for advanced search option, a clickable button named 'advanced search' in hyperlink format is created and highlighted underneath search box. This new mapping relationship has already been applied in other interfaces and is easier to learn and understand.

5.2 How the positive elements are retained

Consistency, rich feedbacks, and error tolerance are the advantages of current interface design. These positive elements are all preserved and applied in the redesign. For example, the way to filter folder and file is consistent throughout this platform and to other standards. Every time user performs an action, corresponding feedback is generated and present to user immediately and automatically. Using Quick Access display change as an example. Once user adjusts the number and/or type of file, the display will be changed right away to help user evaluate current state. User can easily correct their previous mistakes as discussed above.

Overall, all the positive elements are retained to guide interface redesign, which aims to narrow the gulf of execution and evaluation.

6 EVALUATION PLAN

Survey is applied to evaluate the perceived usability and likability for the redesigned file finding process on Google Drive interface.

6.1 Survey evaluation plan

This test targets on current Google Drive users who should meet the following criteria: 1) 18 years old or above, 2) use Google Drive sometimes or more frequent. Survey will be created using PeerSurvey system. A total of 25 targeted participants will be recruited. A sharable link will be firstly posted on Piazza to recruit respondents from GT-students. If there is difficulty in recruitment, the link would then be shared to non-GT-student.

Due to the design of PeerSurvey system and scope of this project, screener questions will not be applied at the beginning of a survey to remove non-targeted audience. Instead, screener is included as part of demographic questionnaire to reduce the turnaround time and complexity. Targeted respondents will be qualified based on the above-mentioned criteria. More details are listed at the end of the questionnaire. Respondent who does not meet screening criteria will be removed before data analysis and this number will be noted in the report.

To limit voluntary response bias, potential respondents will only be notified that this survey is relevant to Google Drive web app. No more details (such as file finding experience) will be revealed in Piazza post or recruitment flyer.

6.2 Evaluation content

A hybrid of qualitative and quantitative questions will be included in the survey. This questionnaire will be reviewed by two different people to remove leading and potential leading question.

This questionnaire will include 4 tasks. The first task is a preference test, which requires user to evaluate their preferred design of main screen layout including the 'advanced search' option and folder and file positions. Current interface and the redesigned version are used as Control and Test, respectively. In the second task, user will rate their perception about Quick Access redesign by answering

the following questions. The navigation flow will be shared to participants through Google slides. The third and fourth task will require user to evaluate the folder and file filter design correspondingly using the same method and questions as described in the second task.

- I think xxx would make file finding process easier on Google Drive. (1- strongly disagree, 3-neutral, 5-strongly agree)
- I think xxx would help me find files more efficiently on Google Drive. (1- strongly disagree, 3-neutral, 5-strongly agree)
- Please rate your overall likability of the design for xxx. (1- strongly dislike, 3-neutral, 5-strongly like)

Demographic questionnaire (screener) about age, gender, and product usage frequency will be listed at the end.

6.3 Discussion

Respondent's perceived usability and likability are direct measurements about user's perception of a design. The results will answer several key questions relating to data inventory, such as how well does the design meet user's goal and needs? Can user rely on this design to achieve desired tasks? Theoretically, higher perceived usability and likability, better the design meets user's requirements. Therefore, the survey results will be analyzed carefully. Results will be discussed and applied as guidance for the final judgement about next-steps.

7 EVALUATION EXECUTION

Only 20 qualified participants (Appendix) were recruited, and their responses were summarized.

7.1 Task 1 – preference for main screen redesign

Figure 10 shows user's preference for Control (current) and Test (redesigned) interface for main screen of Google Drive. Users did not show any significant preference for any version in this project.

Preference for main screen layout design

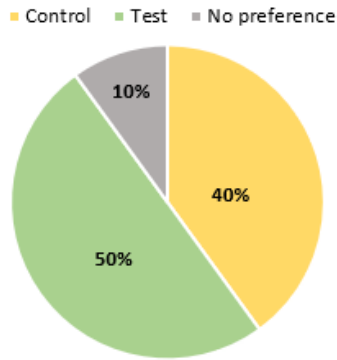


Figure 10— Preference test results

7.2 Task 2 – perceived usability and likability for redesigned Quick Access

Figure 11 presents user's perceived usability and likability of redesigned Quick Access interface. 85% respondents agreed about the statements that the redesigned Quick Access 'make Google Drive easier to use' and 'make finding file more efficiently'. In addition, 90% liked this redesign. These results suggested that usability of Quick Access could successfully be improved by adopting the proposed redesign.

User survey results for Quick Access redesign

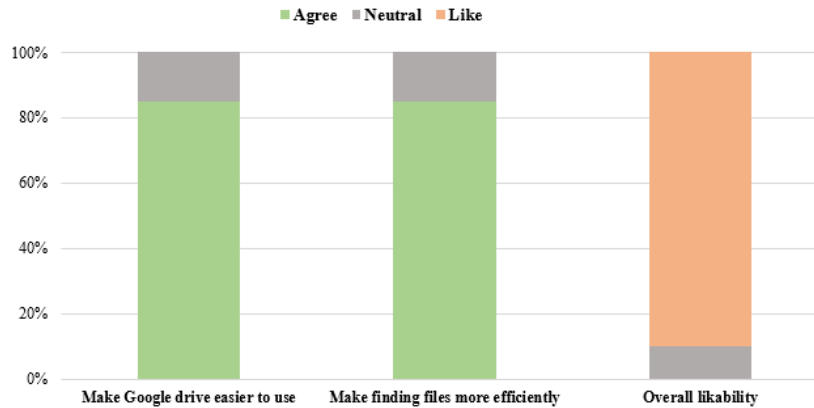


Figure 11— Survey results for Quick Access redesign

7.3 Task 3 – perceived usability and likability for file filtering process

Figure 12 presents user's perceived usability and likability of file filtering process. 55% agreed that addition of file filtering would make 'Google Drive easier to use' and 'file finding more efficiently'. 35% were neutral about both statements, while 10% disagreed that adding this feature would improve the usability of

current interface. Similar results were found for overall likability with 55%, 35%, and 10% liked, neither like nor dislike, and disliked the design respectively.

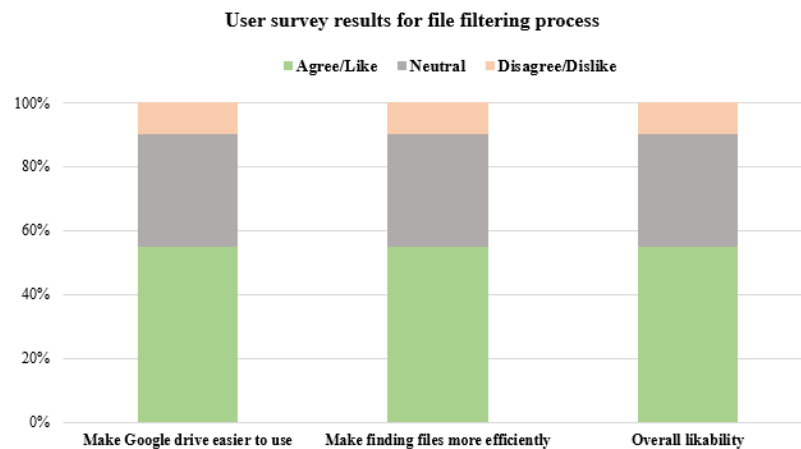


Figure 12 — Survey results for file filtering process

7.4 Task 4 – perceived usability and likability for folder filtering process

Figure 13 shows user's perceived usability and likability of folder filtering process. About half participants agreed that addition of folder filtering would make 'Google Drive easier to use' and 'file finding more efficiently'. 35% - 40% were neutral about this proposed feature, while 10% did not consider this feature as helpful. Same likability results were found for folder and file filtering processes.

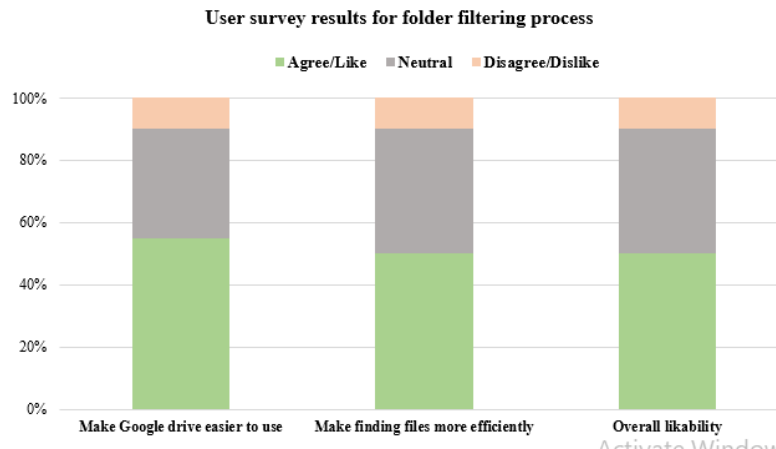


Figure 13 — Survey results for folder filtering process

7.5 Summary and next steps

Only redesigned Quick Access interface showed a clear improvement on perceived usability of Google Drive from this group of users' perspectives. In this redesign, user is allowed to change the type and number of files to be displayed under Quick Access. This improvement in usability likely results from increased flexibility and efficiency. Therefore, it is recommended to increase the fidelity of this redesign and incorporate interactive actions in the next round of user test so that its good usability can be validated by a larger group (~30) of users using a hybrid method of usability survey test and interview.

As for folder and file filtering processes, only half of respondents considered additions of them would be useful and helpful in file finding process. It is unclear why the rest of respondents perceived this design differently. In the initial need-finding survey most users liked this type of addition. It is unclear about the origins of this discrepancy. Is it because designer and user understand filtering process in different ways? Is it because the filter feature is not designed properly in this prototype? It is suggested to keep the prototype as it is to figure out the whys by using interview or/and think-aloud methods.

No clear preference was noticed between the Control and Test design for the main screen layout. It is unclear why half of users preferred Control over Test. In the Test version, two areas are modified: 1) 'advanced search option', and 2) location of files and folders. In the next step, it is crucial to investigate which change(s) could cause an inferior perception about Test compared to Control. Is it because user do not understand the design? Or just because they do not think these changes necessary or helpful? All these questions should be addressed in the future. A potential approach is to redesign this interface into two different versions. The first version only has change in advanced search option, the second version only has change in file and folder location. Then each redesigned prototype will be compared to Control/current design respectively using the same preference method.

Results in this project tends to raise several key questions whose answers are crucial to the next iteration of prototyping and ideations about potential alternatives. One possible substitute would be an interactive prototype allowing user to click through the navigation flow during evaluation. In fact, wireframes can be easily linked to each other on Balsamiq. Due to the limited capacity of

PeerSurvey, researcher failed to build user interaction in this project. In the next round, a more powerful survey platform will be applied.

8 APPENDICES

8.1 Survey questionnaire in need finding

Q1. It is not easy to find a file that I created on Google Drive. (5-point Likert scale)

Q2. It is not easy to find a file shared with me on Google Drive. (5-point Likert scale)

Q3. Searching cannot easily help me find a file on Google Drive. (5-point Likert scale)

Q4. I cannot easily think of a file's name when I need to find it on Google Drive. (5-point Likert scale)

Q5. I cannot easily think of where a file locates when I need to find it on Google drive. (5-point Likert scale)

Q6. If Google Drive would like to add sorting features to help with file finding, which type(s) of sorting would you like to have?

by tags; by creation date; by last edit date; by file type; by owner's name; by owner's email; by other ways (please specify); I don't like to have sorting features

Q7. If Google Drive would like to add filtering features to help with file finding, which type(s) of filtering would you like to have?

by tags; by creation date; by last edit date; by file type; by owner's name; by owner's email; by other ways (please specify); I don't like to have filtering features

Q8. Gender

Q9. Age

Q10. I use Google Drive for...

Home/Work/Other

Q11. How often do you use Google Drive:

Daily/ multiple times per week/ multiple times per month/ less than once per month

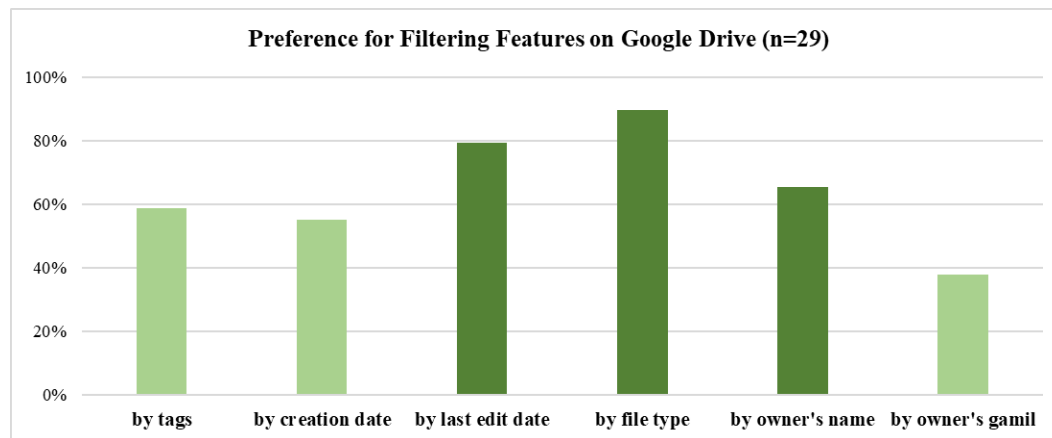
Q12. What do you normally do when you need to find a file on Google Drive:

Use key words to search/ Use file name to search/Go through folders/Check Gmail/Other (please specify)

8.2 Demographic data (from survey, n=29)

Gender		Age			Use Google Drive for			Usage frequency	
Female	Male	18-29	30-39	40-49	Work	Home	Other	Heavy	Light
52%	48%	59%	28%	3%	93%	59%	21%	75%	25%

8.3 Preference for filtering features (from need-finding survey)



8.4 Navigation flow diagram for redesigned interface

<https://drive.google.com/file/d/1rFax3iL-6evXHZSCIIfAEM6dwCS4vjL/view?usp=sharing>

8.5 Survey questionnaire

<https://drive.google.com/file/d/1yyHm4SrQPaFS4a2JUGn2qIEh8xNItzJ/view?usp=sharing>

8.6 Demographic data (from survey, n=20)

Gender		Age			Usage frequency	
Female	Male	18-29	30-39	40-49	Heavy	Light
60%	40%	40%	50%	10%	95%	5%