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The study focuses on how people use their cloud storage and manage their personal information.   Since many cloud storage services allow users to share documents, this study also examines how people manage documents when working collaboratively. There are many cloud storage providers in the market, but this study focuses on two specific systems – Dropbox and Google Drive.

The research was conducted by interviews and the results show that with the differently designed interfaces and functions of cloud storage, people developed diverse ways to use them.   Participants stored different types of files and practiced different management strategies because of different purposes and reasons.   Aspects of the system and user interface also impacted how users managed files.   When working on collaborative and shared documents, participants reported tending to not manage files because they prefer following others' decisions or due to a lack of motivation to manage them.

Headings:

      Cloud Storage

      Personal Information Management

      Information Sharing

A STUDY OF DOCUMENT SHARING AND MANAGING BEHAVIORS IN CLOUD
STORAGE

by
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Introduction

The recent development of cloud storage gives a new option for people to manage and share files. Even though different cloud storage options provide different features, they still have similar functions to fulfill users' needs. First of all, users have an alternative to back up their information and documents. People upload and create files online, arranging them in their preferred cloud storage. Particularly, backup copies become more portable and convenient to users when the storage is accessible on the Internet. Furthermore, users can reach their information in cloud storage via a variety of devices. Many cloud storage systems support synchronization features to help keep information mirrored across the user's different devices.

However, cloud storage represents an extra storage space for users in addition to the local storage of their devices, and it also means that people may face a management problem when they start storing files in cloud storage. When an individual wants to organize files, he or she will develop a personal management strategy for cloud storage, but the user has to compromise with cloud storage's functions and interface design at the same time. In addition, cloud storage often incorporate sharing and co-editing features because of their strong integration with the Internet. Hence, people may use cloud storage as a channel to transfer files and collaborate with others.

Since cloud storage keeps some characteristics of local hard drives and filesystems but also gains more interactive functions for users, it becomes an interesting issue for researchers to know whether users alter their behaviors when they use cloud storage, particularly for personal information and files. Therefore, this study investigates how these features of cloud storage influence users' behaviors and strategies, so we have the following research questions to answer:

- How do users utilize cloud storage for their files and personal information management?   Do they have a preference to store any specific types of documents and information?   What characteristics may influence users' decisions and behavior?

- How do users manage their files in cloud storage?   What features of cloud storage may influence users' managing policy?   Does the managing policy of cloud storage differ from these participants' original strategies for local hard drives?   What is the difference?

- Do users share files with others by cloud storage?   What files do they share and with whom?   Do they cooperate with others by cloud storage?   How do users manage these shared and collaborative files?   What features of cloud storage may influence users' behaviors and strategies?

Literature Review

To investigate the research questions, we first need to review some elements and concepts involved in this topic.

Managing Personal Information

In 1983, Malone published a paper about how people arranged their files, piles and folders in their office (Malone, 1983).   This research described that some people tended to arrange most files to keep their office neat and information organized; however, other people's office spaces were not as neatly organized.   Malone observed two major units of organization: files and piles.   A "file" represented a format of organized information collection, and a "pile" meant a comparatively loose structure for information.   The paper also indicated that the job role had an influence on people's behavior in managing their work information.

Later, Nardi, Anderson and Erickson (1994) conducted an interview study to survey Macintosh users' behaviors when they managed their electronic files.   In this paper, the researchers stated those interviewees may not file in same ways but they did have similar behavioral patterns.   Users had no serious problems to find files.   Even though sometimes they failed to retrieve directly and quickly, the part of file name and search tool could help.   Also, they tended to handle their information as three types: ephemeral, working and archived.   In related work, Barreau (1995) investigated how people organized their files in their electronic spaces.   She pointed out that the electronic work environment provided users a bigger space and multiple channels to deal with files and folders.   Various items were stored and controllable but most of time they may be never utilized.   Additionally, people translated the managing methods

for physical items to electronic files and modified the naming and tagging conventions to match personal needs and to cooperate with others.   In the two studies, Barreau and Nardi both found that people did have preference to organize their files according to the information attributes and the usage of documents, and the content of documents may play a role to impact how they would be classified.   However, the results also showed that different devices may lead people to have different methods and policies for file management (Barreau and Nardi, 1995).

Boardman and Sasse (2004) conducted a long-term observation of a group of users who used various tools to manage their personal information.   The research targets included files, emails and bookmarks. By classifying the subjects' behaviors, they identified different strategies developed by users for these tools and types of information.   Their research indicated that users who adopted many tools may have multiple strategies to manage their files, and although tools might influence people's behaviors, the content and purpose of information might be the most influential factor to determine how users employed tools for personal information management.

Furthermore, Henderson (2011) investigated this issue and found that users' had issues with managing duplicate files even in 2011.   In her research, it was mentioned that the reason people had file duplication was because they owned multiple devices to reach and process documents, and two main types of duplication were redundant files with the exact same content and different or continuous-updated versions.   The study results indicated that people indeed needed help to manage files, because they often created duplicate documents inadvertently. Personal information systems in future should be considered that add features and mechanisms to help users, perhaps by supporting document versioning.

Spreading and Sharing Personal Information

With technology developing, people can collaborate with more devices, regardless of different timing and locations.   Hence, it is potentially troublesome to a team project if files are

scattered in different places, with many different versions.   How to handle this complexity is an emerging issue both in personal information management (PIM) and related technology design.

Dearman and Pierce (2008) interviewed participants who worked on and processed their information with many devices, and they determined their devices and analyzed the purposes of their documents by the device type and context of use. They found several factors that influenced interviewees to arrange their devices and create their managing policies.   For example, mobile devices satisfied users in portability and flexibility.   In addition to job content, work environment and timing made some users have to set separate devices in different locations such as home and office.   At the same time, the design of the system and interface may influence users' different preferences and choices when managing and sharing files.   The authors concluded that portability strengthened users' control and integration for their information and that because the opportunities for information exchange were rising, related new tools and services are becoming prevalent.

Dearman and Pierce's (2008) research suggested out that file synchronization would be important in future technical developments because of users' needs for file integration and information sharing among individuals and groups.   Since the human factor was getting involved more and more in system design, they suggested that we should consider and focus on users, instead of devices, because it is humans who create and then adopt the devices.

Another important factor is users' awareness about sharing and co-editing items. Dourish and Bellotti (1992) indicated that in order to help users working in collaboration, the system and shared workspace should provide awareness information to remind users and allow them work together with high flexibility.   On the other hand, because of the complexity of cooperation, Whalen, Toms and Blustein (2008) discussed how to present awareness information efficiently in a sharing workplace.   They found that some current systems might not clearly show indications of what is being shared to users, and it confused people when they could not distinguish shared items in the workspace.   Without clear indicators of sharing, people usually

felt frustrated when they recognized and managed shared files.   Therefore, how to deal with shared and non-shared items on the same platform has become a rising topic, and it deeply impacts technology development and interface design in personal information management.

Cloud Storage for Personal Information Management

Recently, cloud storage has become popular because its features allow users to not only preserve files but also to interact with others.   Pham (2010) believed that the "cloud" as a new technology required a unique model to support users, and the key characteristic for user interface design should be a good mechanism for items to be organized and shared.

Furthermore, Marshall and Tang (2012) discussed how people employed tools and services for synchronizing and sharing, and how they realized their interaction with the cloud. They found that people used synchronization tools for transferring files between devices or people.   In addition, file activeness was strengthened because people could reach documents online, so it allowed people to share files in cloud-based format. Some cloud services also supports collaborative work, which can help people cooperate more flexibly.

However, even if people understand how the "cloud" works, some features and ideas still should be emphasized and improved.   Users may be concerned with process transparency and file security issues when they use cloud storage.   Furthermore, usability influences users' adoption and preference, so good interface design and conceptual models are essential to attract people in the cloud storage market.   Based on the previous studies, I believe that cloud storage has impacted users' behaviors in managing and sharing, and I selected two popular cloud storage services to examine how people handled their files in the cloud and what factors influenced them.

Methodology

Goals of the Study

The primary goals of this study were to understand:

1. How users use their cloud storage, and what purposes and goals they have for it.

2. What types of information users would like to store in cloud storage and what factors influence their decisions.

3. How users manage their files in cloud storage, and what strategies and factors influence their management behaviors.

4. Whom do users share files with in cloud storage and what factors influence sharing behavior.

Dropbox and Google Drive

Currently, there are many cloud storage products on the market for users to choose from. I decided to focus on two different models of cloud storage to compare. The following paragraphs will introduce the two systems: Dropbox and Google Drive.

1. Dropbox

Dropbox, which started its business in 2008, provides cloud storage and file synchronization for users. After creating a user account, users can download the client software, and may create a synchronized folder across different devices by using the software on each computing device. Thus, users can have the same content and files both online and synchronized locally on personal devices. Dropbox also allows users to reach files via its website and mobile app.

2.   Google Drive

Google Drive was released in 2012 by Google to enable users to store files online, synchronize files and edit content collaboratively.   Individuals may use Google Drive after they create a Google account.   Google drive is also the platform of Google Docs, which is a service with diverse online co-editing functions, including documents, spreadsheets and slides.   Google Docs was released in 2006.   Since it was developed as an online service, Google Drive allows users share files and publish the content on the Internet.

Procedures

1.   Recruit participants who use both Dropbox and Google Drive.

Since Dropbox and Google Drive had been chosen as study targets, research participants were narrowed down from general cloud storage users to the people who used both Dropbox and Google Drive.   In this study, there were nine interviewees recruited as a suitable sample group from current graduate students at the University of North Carolina at Chapel Hill.

2.   Examine the numbers of files and folders in participants' Dropbox and Google Drive.

Before the interview, the investigator contacted each volunteer confirming the meeting schedule and reminding them to bring a personal device for the interview.   In the beginning of interview, all participants were asked to log into their Dropbox and Google Drive so that they could calculate the number of files and folders, including all items, shared items and owner-created items.   This also allowed the investigator to observe the distribution of files and folders in these two cloud storage systems.   By this means, the investigator could have a more complete view about how subjects used their cloud storage, and the collected data could be compared with the interview notes.

3.   Conduct a semi-structured interview with participants.

After counting the numbers of files and folders, the participants were interviewed by the investigator to understand their interactive behaviors with their cloud storage. In these semi-structured interviews, participants were given a copy of the semi-structured interview questions to help facilitate answering the questions. Since they were still logged in to the cloud storage services, participants could also demonstrate their practices and use of the services in response to questions.

Each interview lasted about 30 to 45 minutes, and interviewees could ask questions to clarify any potential confusion. Hand-written notes and audio records were taken by the primary investigator. The audio records were not transcribed comprehensively because there were designed to be a complement to hand-written notes. The records will be discarded after finishing the research.

Questionnaire Design

This interview questionnaire (see Appendix A) contained five parts as follows:

- **Part 1: Quantitative Survey of Cloud Storage Use**

  This part of the questions collected quantitative data from interviewees' cloud storage. After the investigator's demonstration of file calculation method, participants would practice the counting procedure by themselves.

- **Part 2: Survey of Cloud Storage Use**

  The second part of the questionnaire was for examining how users take advantage of their cloud storage. It also was designed to ask participants about their personal information managing behaviors using cloud storage. By means of observation and conversation, the investigator could make comparisons between not only local hard drive storage and cloud storage but also interviewees' self-reports and the researchers' records.

- **Part 3: Survey of File attributes in Cloud Storage**

This section helped the researcher to discover what kinds of files and information users tended to store in cloud storage and what factors would influence users' behaviors.

- **Part 4: Survey of File Management in Cloud Storage**

In this part of the questions, the main goal was to survey users' strategies in file management for their cloud storage and to ask them to describe their methods, such as tagging and naming schemes, so the collected data would show users' preferences and conventions.

- **Part 5: Survey of Shared Items**

Unlike traditional file storage, cloud storage is able to interact with other users easily by online sharing and collaborating. So, the researcher was interested to see how users interacted with others to manage information stored in cloud storage and what kinds of factors influenced the use of these functions. Furthermore, how users managed collaborative items was of interest as well.

Interview Process

Participants were recruited by email lists to SILS master's students and other UNC student groups, such as the UNC Taiwanese Student Association (UNCTSA) and the mail list of SILS Chinese students. Before emailing the subject recruitment letter (see Appendix B), the investigator composed the content, including the topic and procedure, to inform people who are interested in the task. Once receiving replies from people who were interested in this topic, the investigator arranged a workable time both to conduct the interview with the participant as well as to remind them to bring his or her personal device for demonstrating their cloud storage.

After meeting in the arranged time and place, the investigator showed the information consent form (see Appendix C) to inform the participant of his or her rights and duties during the session, and the asked the participant to indicate their agreement to being audio recorded and to provide a signature to indicate their personal willingness to participate in the study.

When the interview started, the investigator began the audio recording and proceeded with the interview by following the interview questionnaire.   All participants had copies of the questionnaire so they could easily follow the process and interact with the investigator according the question sheet.

First of all, the interviewer demonstrated how to count the numbers of specific items in cloud storage, and then the participants would follow the instruction sheet (see Appendix D) to do the counting method to get the required numbers for the interview.

Then, the investigator would continue the interview by asking questions.   If the interviewee had any confusion about the questions, he or she could stop and ask for clarification, and the investigator would explain to make sure the participant understood what kind of question he or she was going to answer.

Analysis

1. **Quantitative Analysis**

The first section of the questionnaire had helped the investigator collect several numbers to show the subjects' features in using cloud storage and to process the numbers by descriptive statistics.   The result would be helpful to present the participants' background and usage of Dropbox and Google Drive among the group of selected subjects.

2. **Qualitative Analysis**

For the questions in part 2 and part 3, the results of survey were expected to show how people use their cloud storage and what types of information people tended to store in Dropbox and Google Drive.   In addition, by the notes made during and after the interviews, some quotations were selected as suitable examples to report.

For the questions in part 4, the results of the survey may show how people manage their files in cloud storage.   Data was collected from subjects in three aspects: two types of cloud storage (Dropbox and Google Drive) and local hard drive, so the resulting

comparison would present the similarity and difference among the three situations. For the questions of part 5, the survey would show how people handled their shared and collaborative items in cloud storage. The two cloud storage systems provided different models for document sharing functions, so the results may be helpful for understanding the benefits of different designs and how different factors affected use.

Limitation

To study how users manage their files and folders in cloud storage spaces, the best approach might be to calculate all files, folders and the layers in each folder, showing the structure of cloud storage. However, due to the limitations, some of the counting had to be done manually, somewhat limiting the scope of the quantitative data about usage of the systems.

Results

Overview

In this research, there were a total of nine participants recruited and gender and degree are distributed nearly evenly.   Their majors were distributed amongst different subjects. Among all nine participants, the distribution of gender was pretty even and there were five Ph.D students and four Master's students composing the research sample.   Also, participants came from 7 different departments in UNC.

In the first part of the interview questionnaire, the researcher asked participants to count the numbers of files and folders, and Table 1 displays the collected results.   Both Dropbox and Google Drive provided a desktop version for their users to use, but users may have had preference for either the online version or the desktop version, so I standardized that all counts were based on the online interface and only considered the top level of the whole cloud storage. Thus, all the counts reported in Table 1 represent the number of items at the top level of the storage for each system.

Participants could start from either Dropbox or Google Drive.   To help facilitate the counting, participants were given an instruction sheet (Appendix D) that contained step-by-step instructions with pictures explaining how to display screens in both Google Drive and Dropbox that would help standardize the counting and make it easier.   In Dropbox, participants did counting manually by watching the screen display and determining files and folders by the symbols. Then, when they calculated the shared items, they repeated what they did before and distinguished shared folders by the folder symbol with two little figures on it.

On the other hand, participants could calculate files and folders in Google Drive by filter function.   The search bar in Google Drive allowed users to filter items in different attributes, so people could easily narrow down their search results.   We applied this function to collect items for counting, and the attributes we used were "all files", "folders" and "not shared". The former two labels could tell files and folders, and "not shared" would help to sort out shared items from all items.   After the filtered results were presented, users could selected all displayed items and click the "download" button, and a pop-out window would show the number of selected items.

Among the nine participants, some were heavy users, i.e., participant #5 and participant #8 (see Table 1), and others may use cloud storage less because they seemed to have relatively fewer files in cloud storage (at the top level).

Participant:	1. How many files/folders are in your Dropbox/Google Drive? (at the top level)				2. How many <u>shared files/folders</u> are in your Dropbox/Google Drive? (at the top level)			
	Files		Folders		Shared Files		Shared Folders	
	Dropbox	Google Drive	Dropbox	Google Drive	Dropbox	Google Drive	Dropbox	Google Drive
#1	1	35	4	0	0	10	4	0
#2	8	24	13	5	0	20	2	0
#3	2	138	3	17	0	138	1	12
#4	1	7	4	0	0	6	2	0
#5	1	**501**	8	**69**	0	**454**	1	**53**
#6	1	37	11	0	0	21	**7**	0
#7	0	39	6	0	0	35	3	0
#8	10	435	**16**	15	0	434	0	11
#9	**31**	23	9	2	0	18	2	2
AVG	**6.11**	**137.67**	**8.22**	**12.00**	**0.00**	**126.22**	**2.44**	**8.67**

Table 1: Total items and shared items in participants' cloud storage

In addition, I also calculated the percentage of shared items (see Table 2).   The calculation may not be suitable to compare because I could not count the exact total numbers of files and folders which were contained in their cloud storages via the current interfaces.   Online

Dropbox interface could only display the numbers of files and folders for top-level and online

Google Drive interface presented files and folders and it was hard to tell their levels. So, the

data in Table 1 does not present the total number of shared files. However, even though the

data do not reflect the whole picture of files and folders in participants' cloud storage, the

calculation in Table 2 does appear that Google Drive was used more for sharing than Dropbox.

Shared %	Dropbox	Google Drive
Files	0 %	91.68 %
Folders	29.68 %	72.25 %

Table 2: The percentage of shared items in Dropbox and Google Drive

General Cloud Storage Use

1. Use of cloud storage

First of all, I investigated the primary purposes of using cloud storage. Participants

were asked to describe how and why they used each cloud storage system. For Dropbox, the

main purpose reported was to store files, and usually those stored files were lecture slides,

finished assignments and backup files with multiple formats. Participant #2 remarked that:

"I used to save my PowerPoint files in Google Drive, but since I found Dropbox can
preserve them with original formats completely, I changed my method."

The recruited participants were students and six pointed out they had to use Dropbox

because of class needs and lecturers' requests. In addition, device synchronization was one of

the primary goals of using Dropbox. For those participants who agreed with this option, two or

even more computers supported their study, work and life so it was necessary to make sure that

they could reach files they wanted on any PC and other devices. For example, participant #5 said

that:

"I took pictures by my iPhone and the Dropbox app can upload and backup right away, so I
can check them via my iPhone and any other devices."

On the other hand, people reported using Google Drive for co-editing more (see Table

3).   All nine participants stated that they had chances to interact with others via Google Drive. Some of them pointed out they had to collaborate with team members for work and assignments, and others mentioned that they may keep records on Google Drive because people contacted each other by Google's "Gmail" and Google chat, so Google Drive could be supportive.   In addition, six interviewees said that they used Google Drive for homework, especially for cooperative work, because it was a convenient way to open it online with some specific people, such as teammates and class peers.

Purpose	File storage	Assignment need	Co-editing	Device Sync	Others
Dropbox	7	6	2	6	3
Examples	• Class slides • Assignments • E-books • Backup files	• Finished homework • Faculty's request	• Work with faculty	• Other PCs • Mobile sync • iPad sync	• Shared media • Class request
Google Drive	4	6	9	0	2
Examples	• Class slides (before using dropbox) • Trivial information backup	• Shared in-class assignments • Peer-reviewed assignments	• Personal activity records • Interpersonal activity records • Collaborative assignments • Team project • Online address book		• Gmail attachment preview

Table 3: Stored document types in participants' cloud storage

2.   Influences in personal information managing behaviors by using cloud storage

Interviewees were asked to self-reflect on their personal information behavior.   In response to a question about whether or not they thought that cloud storage influences their PIM behaviors (questionnaire part 2, question 2), all 9 participants said that working with Google Drive changed their personal information behavior (see Table 4).   Many participants described how Google Drive allowed many users to edit at the same time and that these co-editing functions changed their original cooperative methods, such as face-to-face meeting and email.

Furthermore, participant #5 described that Google Drive functions as a regular work platform for his study and work.   Also, some participants believed that "Gmail" was common and popular so that asking co-workers use Google Drive could be effort-saving for a team project.

However, only four people said that Dropbox influenced their personal information behaviors.   The main factors mentioned were the synchronization and sharing functions of Dropbox.   Participant #2 and #9 described that they could upload files for later use even by different devices but they didn't do so before they used Dropbox.   Nevertheless, five participants thought they still kept their original personal information behaviors.   Some of them indicated that they were not active users of cloud storage so they didn't alter how they store information too much; on the contrary, others said that they used Dropbox desktop version, which integrates with the hierarchical file system of the PC and Mac operating system very well, so they were felt that they didn't have to change their behavior to use it.   These comments are summarized in Table 5.

Does using cloud storage influence your personal information behavior?		
Dropbox	YES	4
	NO	5
Google Drive	YES	9
	NO	0

Table 4: Participant's answers for whether cloud storage influences their behaviors

Factors of how cloud storage influences users' personal information management	
Dropbox	• Synchronizing files for later use • Storage could be shared • Compared with Google Drive, Dropbox is able to preserve more document formats and original file formatting • Compared with Google Drive, the interface of Dropbox looks more like general operation system.
Google Drive	• Able to work with peers at same time and different places. • Better co-editing functions • High popularity of use • Simulation of regular working platform

Table 5: The factors of how cloud storage influences users' PIM

Survey of Attributes of Stored File in Cloud Storage

In order to analyze the attributes of files and information, participants were asked to examine their files and discuss the types of documents and information (questionnaire part 3, question 1).

1. Document types

Document types	Small Documents	Large files	Media	Photos	Other
Dropbox	8	3	6	7	2
Examples	• Homework • papers	• Temporary working files	• Movie • Audio records	• Class reference • backups	• PowerPoint templates • software, i.e., Photoshop
Google Drive	9	2	1	1	0
Examples	• Most of them are Google documents		• music	• photos shared from friends	

Table 6: The result of stored document type survey

This purpose of this section of the study is to understand what users tend to store in their cloud storage and the results are shown in Table 6.   For both Dropbox and Google Drive, participants were apt to preserve a lot of small documents.   However, people stored more PDF documents and general office files, such as Word and Excel, in their Dropbox, because Dropbox was more compatible for all types of formats.   On the other hand, since Google Drive can create Google documents for users to edit, most of stored small documents were Google documents, such as "Google doc" and "Google spreadsheet."

Interestingly, in other types of documents, Dropbox and Google Drive presented very different situations, as shown in results (see Table 6).   For Dropbox, the participants also used it to store files such as media and photos.   Some interviewees considered that Dropbox can help them to backup and others said they used Dropbox to share.   In addition to the two main reasons above, some interviewees pointed out that they believed that Dropbox had less restraint on size and format of files, and that is why they chose Dropbox for backup.

Yet, the survey indicated that those participants tended to not store files with other types in Google Drive.   When asked the reasons, participants presented their doubts. For example, Participant #9 worried that:

> Media files might be too big for Google Drive, I think.   So, I probably don't want to store those files in my Google Drive. They may crash it.

2.   Information types

Participants were asked about the types of information they stored in terms of temporary-use items, consistent-work items, and archived items (questionnaire part 3, question 1).   These results are summarized in Table 7.

Information types	Temporary use	Consistent work	Archive
Dropbox	6	4	8
Examples	• Progress report	• Collaborative papers	• Document backup
Google Drive	6	7	7
Examples	• Gmail attachment preview • Personal and interpersonal activity records • Communication channel; shared post-it notes	• Expense sharing sheets	• Contact information in groups ("online address book")

Table 7: The result of stored information type survey

Surprisingly, participants' answers were distributed across all kinds of information, which means interviewees in this recruited group may use their cloud storage in multiple ways. For Dropbox, eight participants said they stored archived information but they also put some temporary files in their Dropbox.   For example, participant #6 mentioned that she had some progress reports for her work stored in her Dropbox folder, due to the files' special format.

On the other hand, Google Drive also contained various types of information and these participants presented diverse goals and methods to use Google Drive. For instance, participant #1 archived an address book for a team he worked on before because he wanted to keep in touch

with those friends by this way, and he had a Google spreadsheet to record shared expense for his

phone bill.   Participant #4 showed his past trip schedule, which was shared with his travel

mates; moreover, participant #9 opened an untitled file during the interview, saying that:

> See? This is my 'chat record' with my classmate after class for preparing the next in-class
> presentation! We did chatting online in Google docs, so we can talk and record at the same
> time!

After identifying types of documents and information in cloud storage, participants

explained the factors influencing their methods and decision to store files.   Many interviewees

believed that Dropbox had larger space to store their online backup and that the system accepted

saving diverse formats and types of files.   Therefore, they considered Dropbox as an extension

of their local hard drives and preferred to store multiple files in Dropbox.

In contrast, some participants were concerned that Google Drive did not provide them

with enough space.   Participant #2 and #9 indicated that they did not know how to check the

quota of their Google Drive, and that was the reason that they tried not to upload too many files

in it.   Besides, several participants thought that Google Drive's interface was not very

convenient and easy-to understand, so that they lacked motivation to practice any other

unfamiliar functions like creating folders and tagging.   Some people stated that although the

Google Drive interface was not so user-friendly, they would still use it because it seemed to be a

trend in communication and a common tool among peers, so Google Drive has become the first

choice for them to cooperate with others.   These comments are summarized in Table 8.

| Dropbox | • Larger space; online backup
• Easy to upload files**; faster to upload**
• **Able to store diverse formats and files**
• **Better user interface**
• **Extension of PC's hard drive**
• **Convenience; lazy to bring flash memory and external hard drive**
• **Personal convention: Early user, mobile sync** |

Google Drive	• Space issue: **not sure about the space volume;** believe that Google Drive has less space • Lack of experiences about interacting with the interface; believing that Google drive's UI was not user-friendly • **A common tool among peers: keep using it to stay on the same page with others** • **Collaborative works**

Table 8: The comments of using cloud storage from participants

Therefore, in the end of this section, participants did a self-evaluation about their

activeness when they used Dropbox and Google Drive (questionnaire part 3, question 2). More

people believed they actively used Dropbox because they stored files by their willingness, and

on the contrary, many interviewees thought that they used Google Drive passively because they

had to collaborate with others in working (see Table 9). One participant even said that:

"I was 'forced' to use it in the beginning, though I accepted it later."

Users' subjective feeling when using Cloud storage		
Dropbox	Active user	6
	Passive user	3
Google Drive	Active user	3
	Passive user	6

Table 9: Participants' attitude in cloud storage using

Cloud Storage Management

1.   Difference between Dropbox and Google Drive

Do you manage your cloud storage?		
Dropbox	YES	6
	NO	3
Google Drive	YES	0
	NO	9

Table 10: Survey of participants' managing convention

Table 10 presents whether these participants managed their cloud storage, and it

indicates that they may tend to manage Dropbox but not manage Google Drive. In this section,

the interview investigated how they managed (or why they did not manage) their cloud storage

(questionnaire part 4, question 1).   Participants usually named files and folders by content. For example, the names of classwork and homework were based on lecture title, course number and semester, so they managed them with folders structured by a similar naming system.   In addition, some people classified all files into suitable folders, but others may keep some scattered files out of any existing folders. Most people who didn't classify files completely said that those files were hard to sort.   Yet, participant #2 had different explanation: she would like to keep files with higher use-frequency in the top level so that she would not have to click folders to reach them.

Different from Dropbox's situation, all nine participants declared they didn't manage Google Drive (see Table 10).   Most of them thought since they were the receivers who got files from others, and since files are "owned" by others, they thought they didn't have the right to manage them.   In addition, many interviewees complained that the interface of Google Drive was not helpful for management and three of them said that they even had no idea how to create folders to organize files.   Participant #5 explained how he didn't manage his Google Drive: because Google Drive listed all files by updated time and the layout was designed for browsing, it was unnecessary to sort items since he could find earlier files by searching.   These comments are summarized in Table 11.

Methods of cloud storage management and influential factors	
Dropbox	• **File name: usually based on semester, class and personal activity, such as personal hobbit, content…etc** • **Scattered files: hard to classify or high frequent used** • Shared items can be managed by different shared folders • Search function can help when users tend to not manage
Google Drive	• **File name: files are usually created by others, so the names are usually decided by creators.** • **Most of files are shred items and group works** • **The design of user interface is not helpful to manage files** • Didn't know how to manage; didn't know how to create folders • No need to manage: usually the file's name is detailed enough to tell the content.

Table 11: The result of method for cloud storage management

After describing the difference of management between Dropbox and Google Drive, participants were requested to compare and explain how they managed local hard drive and cloud storage (questionnaire part 4, question 2).   All interviewees pointed out that they were sure that their management of Google Drive differed from how they organized their local hard drive; on the contrary, the ways they managed Dropbox were usually similar to their original and general methods for hard drive organization, except two participants.   The results are presented in Table 12.

Is the way you manage your cloud storages similar to your local hard drive?		
Dropbox	YES	7
	NO	2
Google Drive	YES	0
	NO	9

Table 12: The comparison result of management method similarity between local drive and two selected cloud storage

At the same time, participants explained the reasons why they managed (or did not manage) files in cloud storage, and their reasons are concluded in Table 13.   In cases of Dropbox, participants stated that the design supported their original naming and filing policies, and the interface could display folders' structure in the same way their PCs and Macs did, so they thought that they had no issue with using familiar structures.   Moreover, participant #2, #8 and #9 said that they considered it as an extended space of their own local drives.

Comparatively, all participants thought their managing policies for Google Drive were very different from how they arranged their local hard drives, based on diverse reasons.   For people who considered they were light users, they thought the periods for editing in Google Drive were short and those documents were relatively unimportant, so it is "okay" to disregard the management issue.   For other interviewees, there were too many shared items so they didn't know how or want to handle them.

Reasons why users believe that how they manage cloud storage is like (or unlike) how they manage their local hard drives.

Dropbox	• Relatively similar to interviewees' original managing ways
	    ◆ Easy to create folders; Named by content
	    ◆ Consider it as an extension of local hard drive
	    ◆ Consider it as an online backup space

Google Drive	• Different from interviewees' original managing methods
	    ◆ Short using period because of short-term editing
	    ◆ Files have less importance
	    ◆ Too many co-editing items make users not to modify
	    ◆ Naming by content or event goal, even no title
	    ◆ Probably manage personal files but not to manage others' or shared files

Table 13: The influential factors of cloud storage managing when comparing with managing personal local hard drive

Therefore, when asked the frequency of managing cloud storage(questionnaire part 4, question 3), more participants answered that they may never manage their Google Drive, but more people handled files and folders in Dropbox regularly in different frequency (see Figure 1).
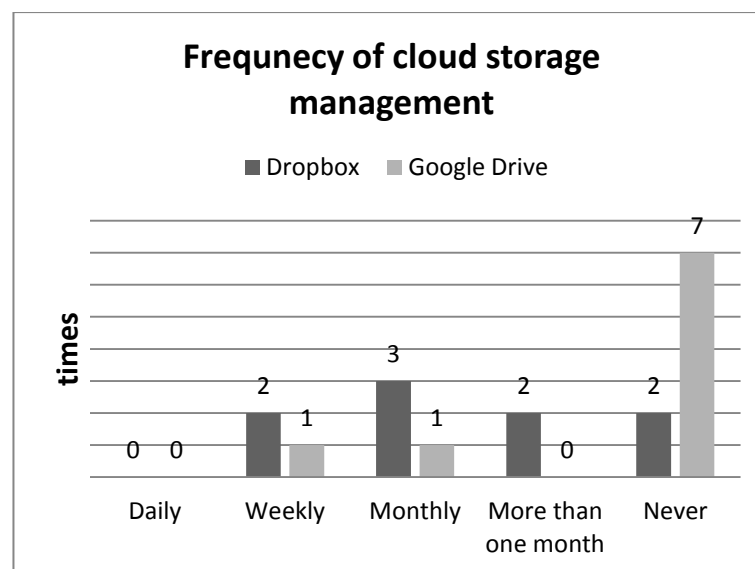

Figure 1: Frequency of cloud storage management

Cloud Storage Sharing Behavior and Collaborative Work Management

Since cloud storage allows users share information, it is important to know with whom

users are willing to share information and receive their files via cloud storage, and what kinds of information are highly shared in this sort of behavior and process.   The questions (questionnaire part 5, question 1 and 2) on this topic were divided into two parts as "shared with" and "received from", and participants were asked to describe whom they shared with or received from and explain what files they exchanged.
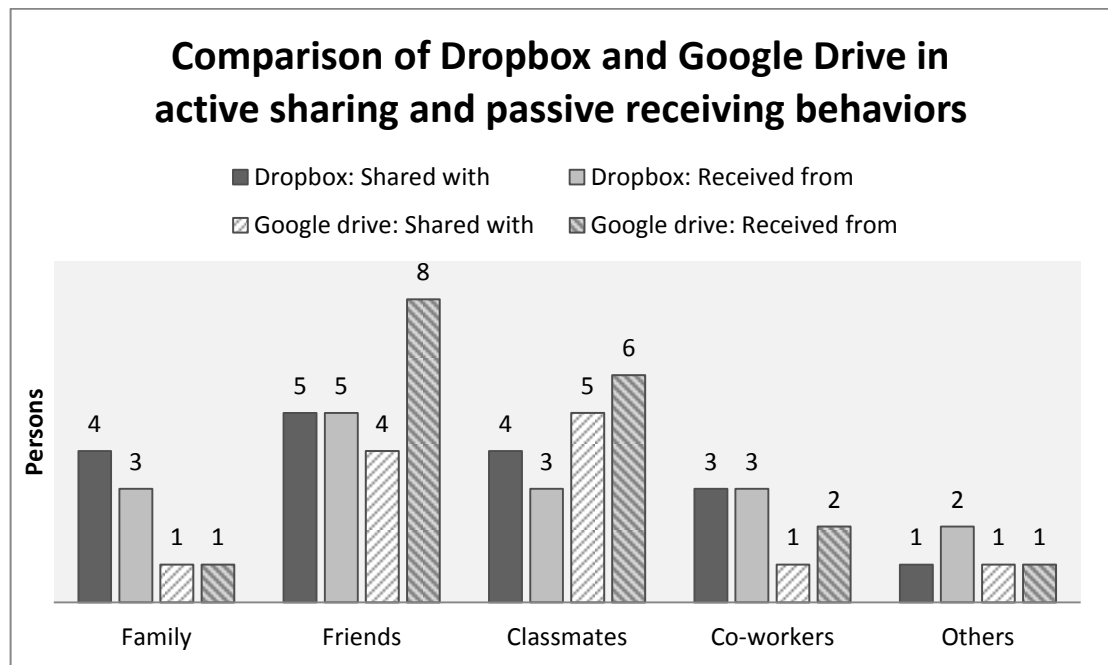
1.   **Dropbox vs. Google Drive**

Figure 2: 'Sharing with' and 'receiving from' across different cloud storage services and different personal relationships

The chart in Figure 2 is for comparing Dropbox and Google Drive in sharing issues, and the numbers in Figure 2 are numbers of participants who indicated each type of people they shared with or received from.   Although all types of relationships had sharing and or receiving of files via cloud storage, peers (friends and classmates) were most prevalent in both Dropbox and Google Drive.   Among the participants in this study, they had more sharing/receiving with family and co-workers in Dropbox, but Google Drive was used more frequently among participants' friends and classmates.   In addition, many participants considered that they were the people who received files from others, instead of being the one who actively shared

information.

2. Active sharing vs. Passive receiving

When participants described who they shared files to or received files from, they also explained what kinds of information they exchanged.   According the following tables (see Table 14 and 15), people shared diverse files via Dropbox to multiple people, but in the case of Google Drive, users tended to only share small documents among friends and classmates with different purposes.

During the interviews, some participants indicated that they were subjectively aware that using Dropbox might be more formal when they exchanged information with those who had higher status and value, such as faculty and clients.

On the other hand, because Google drive is connected with personal "Gmail" (Google email service) instead of personal devices, it seems more suitable to share and even publish personal works via Google Drive on the Internet.   For instance, participant #7 stated that sometimes he may share his works by Google Drive.   He thought Google Drive was a good way to reduce risk and interruption from the web, because Google Drive only linked to his Gmail account, instead of his personal devices and local hard drive.   He also received shared files from other "netizens".

Active sharing	Family	Friends	Classmates	Co-workers	Others
Dropbox Examples	• Video • Music	• Photos	• School work	• Co-edited papers	• documents for clients
Google Drive Examples		• Travel information and schedule	• Team project for class		

Table 14: The examples of active sharing

(Passive?) receiving	Family	Friends	Classmates	Co-workers	Others
Dropbox Examples	• Video • Music	• Photos • Music	• School work	• Co-edited papers	• References from faculty
Google		• group	• Team		• Netizens:

| **Drive Examples** | members' contact information
 • interpersonal activities: potluck party, traveling | project for school work
 • Group assignment | documents |

Table 15: The examples of passive receiving

3.   Collaborative work

In addition to sharing files, people may use cloud storage to collaborate.   In order to know whether collaborative documents were managed as general files, participants answered how they worked with others in cloud storage and how they managed these items (questionnaire part 5, question 3).

All nine participants had co-edited items in Google Drive, and all of them explicitly indicated that they did not manage them.   Compared with the uniformity of Google Drive, only four participants worked collaboratively via Dropbox, and only one person would like to manage cooperative files (see Table 16).

Although people tended not to manage cooperative documents both in Dropbox and Google Drive, the reasons and influencing factors were different (see Table 17).   One reason was that people preferred following others' decision and behavior due to personal laziness. Participant #1 remarked that,   "I am just too lazy to manage. I don't think it's necessary."

Besides, particularly for Dropbox users, they were concerned that if they made any change, it may impact the structure and file position so other users might lose track of those shared and collaborative documents.

On the other hand, more interviewees considered themselves as passive users who received files from others (lack of ownership), so they preferred not to modify anything out of respect.   Also, low importance was another primary factor which influenced them to avoid any management in Google Drive.

	1. Do you have any collaborative work in your cloud storage?		2. Do you manage your collaborative work in your cloud storage?	
Dropbox	YES	4	YES	1
	NO	5	NO	3
Google Drive	YES	9	YES	0
	NO	0	NO	9

Table 16: the survey of collaborative work and its management

Reasons and factors which influenced users' management for collaborative works	
Dropbox	• **Didn't want to manage files and folders shared with others** • Prefer to follow others' action; coordinate with others • Concern that others may lose files if he or she did any change
Google Drive	• **Without ownership of files and folders; coordinate with others** • **Files have low importance; unnecessary to manage** • Consider "I" am a passive user; prefer not to manage actively. • Feel it's hard to manage files • The interface is equipped with search function; "why manage?"

Table 17: Participants' comments and influential factors about collaborative file management

Discussion

Background

In the first section of the interview, participants provided information about the numbers of files and folders in top-level of their Dropbox and Google Drive. Due to the system limitations I could only count items in the top layer, and it was hard to investigate the depth of folders and volume of files. Therefore, it is difficult to completely describe participants' degree of use and sharing in each system quantitatively. However, by using the counts provided and interviewees' responses, we can find several interesting examples from the group of participants. For example, participants #5 and #8 claimed that they believed they are "heavy users", and participant #1 and #4 said that they thought they should be light users because they had less activities in cloud storage. Their qualitative answers relatively corresponded with the quantitative results of item counting in the top level of their cloud storage.

General Cloud Storage Use

The aim of this section of the interview was to investigate interviewees' cloud storage use and the factors influencing their behaviors and decisions. According to the previous results, it is known that the methods which users employed in Dropbox and Google Drive were different. Participant #5 clearly pointed out that Dropbox and Google Drive were functionally complementary for him to support his life and work needs. Some of other participants had similar ways to use these two tools, even though they did not describe this situation in the same words. Usually, Dropbox was described as used for file backup and Google Drive was preferred for information sharing and collaborating. The main reason cited for this difference

was the design of system.

In order to fully install Dropbox, users must download the client software, so users would create a synchronized folder on their personal device(s)   As a result, most users were trained to interact with Dropbox via the folder.   Particularly, the system design makes the synchronized folder simulate other local folders, according the device's operating system. Therefore, users could save efforts from learning to interact with a new interface.   It was the main reason why some participants could consider Dropbox as an extension of their local hard drive.

However, Google Drive is connected with a Google account, so the user must log in first for any later use.   Many users adopted this interface when they started taking advantage of Google Docs, so they have adopted the online work, instead of the later released desktop version. From 2006 to 2012, people have developed a variety ways to use Google Docs and Google Drive, and this may have contributed to the diversity of use between Dropbox and Google Drive.

Survey of Attributes of Stored Files in Cloud Storage

1.   Document Type

According to the interview results, participants preferred to store various types of documents in Dropbox rather than in Google Drive.   In Dropbox, the system has no constraint for document types and preserves complete formatting for each item, so that users may easily store diverse files.   In contrast, Google Drive only allows users preview partial types of stored files on its interface.   Also, in order to display the content of file in Google Drive interface, some formatting in documents may be lost and changed due to the compatibility issue.   Hence, some participants indicated that this issue would be considered by them before they stored some specific files.   For example, participant #2 used to store PowerPoint files in her Google Drive, but once she found Dropbox was more convenient and it could preserve the formatting more completely, she changed her method for storing PowerPoint files.   Furthermore, the investigator

could observe that some participants only stored Google Docs in Google Drive.   Consequently, the system design and perceived function constraints may not just impact the types of documents directly but also influence users' behaviors and decision about use for their work division indirectly.

2.   Information Type

Although it was surprising to find that all types of information were stored in both cloud storages, there are still some interesting results worth discussing.   After analyzing the cases provided by all nine participants, two main reasons help explain users' PIM behaviors. The first reason was people's various methods of using cloud storage.   Because of users' creativity and innovation, cloud storage was not just a service and space to store something. For example, participant #9 described how she used Google Drive to communicate with her classmate and accomplish their collaborative assignment at the same time. On the other hand, several participants mentioned that they might create files for temporary use in the beginning but later preserve them for the future.

Therefore, it seemed that online storage made files extend their duration because any information could be useful and helpful in the future and the cost for users to preserve them was too low to be considered, so keeping everything in their storage might not be a bad thing.

The other reason was laziness and unawareness.   Some participants simply stated that they were too lazy to manage files, and others said that they did not notice that their cloud storage required some management.

Cloud Storage Management

1.   Comparison between Dropbox and Google Drive

Since the previous findings pointed out people may use Dropbox and Google Drive differently, it was possible that users may have divergent strategies to manage them.   In the investigation, six participants agreed they still managed their Dropbox but all nine people

answered that they tended not to manage files in Google Drive.   By analyzing their reasons, there were some primary factors influencing their behaviors.

First of all, the interface design seemed to play a role in this management issue.   The interface design led users to interact with Dropbox as they used their folders in personal devices, so users could adopt it very soon.   In addition, the folder simulation allowed users keep applying their original strategies to manage all items, including naming schemas and folder structures.

On the contrary, users may interact with Google Drive via the online interface more, so the different interface design and way to display file structure influenced user to develop other policies to handle items.   Moreover, users may quit organizing files before they find a better method of sorting and then get used to this situation later.

The other possible reason was the diversity of files in Dropbox.   Because users stored more diverse document formats in Dropbox, users may think it was necessary to organize these files.

2.   Comparison between local drive and cloud storage

This section also looks into the difference between users' management in local hard drive and cloud storage.   Participants described how they manage their local storage, comparing to their methods of managing cloud storage, and I found that more people agreed that the ways they managed their hard drives in personal devices was more similar with how they managed Dropbox, instead of Google Drive.

The study results indicated that users had less adoption issues in Dropbox, and Dropbox was considered as a personal devices' extended storage, so users may claim that they had more control and ownership in Dropbox.   In contrast, more participants believed that they were the receivers who get shared files from others in Google Drive, so these people tended to not modify any files due to a lack of feeling of file ownership.

Interestingly, the results corresponded with how the group of participants expressed

their attitude in using cloud storage: more people considered themselves as active Dropbox users; on the other hand, many people believed they were passive Google Drive users because many of them stated that they felt like there were pressures to use Google Drive when they worked with others.

Cloud Storage Sharing Behavior and Collaborative Work Management

1. File exchange

It was very interesting to have a cross comparison between the user's behavior and different cloud storage systems, and the result also corresponded with the other analysis in previous sections. The complementary attribute between the two cloud storage products was one of the good examples. In this study, compared with Google Drive, less people used Dropbox for collaborative work. For those who didn't employ Dropbox to cooperate, one of main reasons was information security and ownership. These people believed that Dropbox was part of their hard drive instead of an independent area, so a collaborative work made them feel that personal space had been involved or even interrupted by external objects.

For those who were willing to share and work with others via Dropbox, less constraints helped. These people claimed that they thought Dropbox could support various file types and hold original format better for them to store documents comprehensively. Therefore, some users chose using Dropbox for format preservation when they worked with supervisors. Participant #6 mentioned that she had to use Dropbox to collaborate with her advisor and peers because Google Drive did not support her documents' format. Here is what she said,

> "I use LaTex to edit my paper and collaborate with others. I don't think Google Drive can present or even preserve *.tex* files, so I still choose Dropbox. My teammates do so (using Dropbox to share and cooperate), too."

2. Collaborative work

The interviews indicated that even though the result showed that people were willing to manage Dropbox, the participants still tended to not organize collaborative files in either

Dropbox or Google Drive.   The investigator has found that the primary reasons were laziness and lack of motivation to manage co-editing work.

In addition, users stated that they did not organize collaborative documents both in Dropbox and Google Drive, but they had different reasons to explain their behavior.   In Dropbox, users worried more about the mess structure and the potential impact to the others if they made any modification.   However, people described that passive attitude and lack of ownership was the main reason that they didn't change anything on co-edited documents in Google Drive.   As a result, it seemed that when people used Dropbox, they might be considering others' feelings about how items were organized.   In other words, when people use Dropbox, they appeared to be having higher "citizenship" among the co-working group.   It also seemed that the connection between Google Drive and a person's individual Google account may have led participants to think about themselves more.

Conclusion

According to above analysis, users' behaviors and decision-making appear to be influenced by the system design and participants' past experiences.   Using a new technology requires time and effort to adopt, so generally people preferred to interact with something familiar for shortening the adoption period.

1.   The impact from system and interface design in cloud storage

In this study, Dropbox and Google Drive played very different roles with different interfaces to interact with users, even though both of them offered cloud storage.   The high familiarity of the interface leads the participants to explore functions of Dropbox, but Google Drive's interface relatively contained more uncertainty.

For example, when people got used to using Dropbox, they became concerned with the available quota and how to manage the space.   On the other hand, there were still some participants in our research said that they had no idea about how to check the volume of Google Drive and how to create folders to manage files.

Also, when Dropbox launched their service, the install procedure asked users to create a synchronized folder by client software; however, Google Drive developed their desktop version and released it in 2012, but many users may have been accustomed to employing the online interface and developed a customized personal policy to deal with file storage in Google Drive.

Therefore, Dropbox may be viewed as an external hard drive, and Google Drive alternated as a channel to interact with others as well as store fragments of information.   The results revealed how the interface and system design influenced users' behavior, and familiarity

and usability were important to impact how people take advantage of the tools and services.

2.   The impact from collaborating with others in cloud storage

One of the characteristics of cloud storage is that it enables users to share files and cooperate with others.   In the past, people probably used email to exchange co-edited documents.   In order to clarify every editor's part and version, people could attach a short fragment of information as a notice, such as adding initials and time in the document's name, and each editor had equal status to be responsible for this work.

However, online co-editing allows users to modify quickly, and since changes happen so fast, it impacts users' "feelings" regarding these documents and their partners.   For instance, some participants in the study responded that they felt like they lost document ownership and so they preferred not to change anything.   The other typical idea was that "if the others feel fine. Why change? "

From the above cases, it appears that people may have changed their approaches when they took advantage of cloud storage to work together.   Moreover, the result may lead to a new form of collaboration, which further influences group activity in information management.

3.   Interface vs. interaction: which one might be stronger to influence users most?

It is an interesting question in this behavioral study when researchers would like to know how much a new technology can change the users' behaviors.   Working collaboratively with cloud storage services appears to be a trend for the future, and group work still requires management, especially for serial projects and programs.   Therefore, how to overcome the conflicts between users' needs and systems features will be an on-going issue to explore.

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Appendix A: interview questionnaire

This guide will be used for the interview.   Both the interviewer and the interviewee will have a copy to refer to during the interview.

Questionnaire for interview

Part 1: Quantitative Survey of Cloud Storage Use

1. How many files are in your Dropbox/Google drive?   How many folders are in your Dropbox/Google drive?   Please see the instruction sheet for guidance about how to find these numbers.

	files	folders
Dropbox		
Google drive		

2. How many shared files are in your Dropbox/Google drive?   How many shared folders are in your Dropbox/Google drive?

	Shared files	Shared folders
Dropbox		
Google drive		

3. How many files are owned by you?

	Owned files
Dropbox	
Google drive	

4. How many levels deep is your deepest folder in Dropbox/Google drive?

	#
Dropbox	
Google drive	

5. How many files are in the largest folders in your Dropbox/Google drive?

	#
Dropbox	
Google drive	

Part 2: Survey of Cloud Storage Use

1. How do you use Dropbox /Google Drive?   Please describe your use of Dropbox and Google drive separately.

Purpose	File storage	Assignment need	Co-editing	Device Sync	Other
Dropbox					
Google drive					

2. Do you think using Dropbox /Google drive influences your PIM behaviors?   What is the difference after you started using use Dropbox /Google drive?

Dropbox	
Google drive	

3. Please find the five files that you used most recently in your Dropbox/Google drive, and please explain their purposes.

	1	2	3	4	5
Dropbox					
Google drive					

4. Please find the five files that you used the longest time ago in your Dropbox /Google drive, and please explain their purposes.

	1	2	3	4	5
Dropbox					
Google drive					

Part 3: Survey of File attributes in Cloud Storage

1. What types of information do you store in your Dropbox /Google drive?

Document types	small documents	large files	media	photos	Other
Dropbox					
Google drive					

Information types	temporary-used	consistent-working	archived
Dropbox			
Google drive			

2.   What influences your decision whether to store information in your Dropbox /Google drive?

Dropbox	
Google drive	

Part 4: Survey of File Management in Cloud Storage

1.   How do you manage files in your Dropbox /Google drive?   Do you have any strategies for managing them?   Include information about any naming convention, organizational scheme, tagging, etc.

Dropbox	
Google drive	

2.   Do you use the same management strategies for Dropbox/ Google drive, and your local hard disk, or do you manage them differently?   Please explain.

Dropbox	
Google drive	

3.   How often do you spend time organizing your files and folders?

Times	Daily	Weekly	Monthly	More than one month	Never
Dropbox					
Google drive					

Part 5: Survey of Shared Items

1. Do you share files in your Dropbox /Google drive?   Why do you share them?   Whom do you share with?

Shared to	family	friends	classmates	Co-workers	Others
Dropbox					
Google drive					

2. Have you received shared items from others?   Are they files or folders? Why do those people share?   Who are they?

Shared from	family	friends	classmates	Co-workers	Others
Dropbox					
Google drive					

3. Do you have any collaborative files in your Dropbox/Google drive?   If yes, how do you manage them?   Do you change your management strategies because they are shared?   If yes, how does it differ from your original strategies for your personal files?

Dropbox	
Google drive	

Part 6: Demographic questions:

1. Your gender. (Male/Female)
2. Your academic background and level. (Major; Undergraduate/Master/Ph.D.)

Major			
Degree	undergraduate	master	Ph.D

3. Please describe your computer skill level.

Appendix B: subject recruitment letter

Subject: Participants needed for an interview study about use of Google Drive and Dropbox

Hello students –

This is SILS master's student, Yu-Hsuan Chang.   I am conducting a research study entitled "A Behavioral Study of Sharing and Managing Behaviors in Cloud Storage: Google Drive and Dropbox", for which I am inviting you to participate in an interview.

My research asks about how users use their cloud storage to manage and share their personal information.   I am asking you to help me investigate these questions by participating in my interview and answering few research questions.

In order to participate, you should have used BOTH Dropbox and Google Drive over the past six months.   During the interview, you will need to show the experimenter your Dropbox and Google Drive on your own laptop computer or other devices.   The interview will also be audio recorded. The interview location would be in SILS library or Davis library.   Your participation has no effect on class standing, grades, or relationship with UNC faculty.

Please respond by email (yuhsuanc@live.unc.edu) if you are interested in participating in this study. The interview will last about 30-45 minutes, and the available times are:

Session A: Monday, 12:00pm-5:00pm
Session B: Wednesday: 12:00pm-5:00pm
Session C: Tuesday 9:30am-5:00pm
Session D: Thursday: 9:30am-5:00pm

Thank you for your help!

-- Yu-Hsuan Chang
yuhsuanc@live.unc.edu

Appendix C: information consent form

University of North Carolina at Chapel Hill
Consent to Participate in a Research Study
Adult Participants

Consent Form Version Date: 2013.02.01
IRB Study # 13-1107
Title of Study: A Behavioral Study of Sharing and Managing Behaviors in Cloud Storage: Google Drive and Dropbox
Principal Investigator: Yu-Hsuan Chang
Principal Investigator Department: School of Information and Library Science
Principal Investigator Phone number: 919-360-7272
Principal Investigator Email Address: yuhsuanc@live.unc.edu
Faculty Advisor: Robert Capra
Faculty Advisor Contact Information:
   UNC-Chapel Hill Phone number: 919-962-8366
   Study Contact Email Address: rcapra@unc.edu
   Study Contact telephone number: 919-962-9978

_____

What are some general things you should know about research studies?
You are being asked to take part in a research study.   To join the study is voluntary.
You may refuse to join, or you may withdraw your consent to be in the study, for any reason, without penalty.

Research studies are designed to obtain new knowledge. This new information may help people in the future.   You may not receive any direct benefit from being in the research study. There also may be risks to being in research studies.

Details about this study are discussed below.   It is important that you understand this information so that you can make an informed choice about being in this research study.

You will be given a copy of this consent form.   You should ask the researchers named above, or staff members who may assist them, any questions you have about this study at any time.

What is the purpose of this study?
The purpose of this study is to observe cloud storage users' information behaviors in personal file management. Also, this study will examine how specific features of cloud storage tools influence users behaviors.

Are there any reasons you should not be in this study?
You should not be in this study if:
- You are younger than 18 years old.
- You are not a student at UNC Chapel Hill.
- You are not fluent in speaking and writing English.

How many people will take part in this study?
There will be approximately 15 people in this research study.

How long will your part in this study last?
Participation will consist of a single session that will last about 30 to 45 minutes.

What will happen if you take part in the study?
If you agree to participate, we will arrange a mutually agreeable time and place to interview you about your personal information behavior using cloud storage.   We will take hand-written notes and make audio recordings, but we will delete the audio recordings and notes after the research project is completed.
For any reason, you may choose not to answer any question that is part of the study.

What are the possible benefits from being in this study?
Research is designed to benefit society by gaining new knowledge.   You will not benefit personally from being in this research study.

What are the possible risks or discomforts involved from being in this study?
We believe the risks in this study to be no more than those encountered in everyday life. There may be uncommon or previously unknown risks. You should report any problems to the researcher.

How will information about you be protected?
We will assign an identifier to the data we collect and will not use your name.   In written reports, we will not use your name and will make additional efforts to anonymize data. The data we collect may be stored on our computers.   After the analysis for this project is completed, we will delete and/or destroy the originally collected data.
Participants will not be identified in any report or publication about this study. Although every effort will be made to keep research records private, there may be times when federal or state law requires the disclosure of such records, including personal information. This is very unlikely, but if disclosure is ever required, UNC-Chapel Hill will take steps allowable by law to protect the privacy of personal information.   In some cases, your information in this research study could be reviewed by representatives of the University, research sponsors, or government agencies (for example, the FDA) for purposes such as quality control or safety.
Check the line that best matches your choice:

_____ OK to record me during the study

_____ Not OK to record me during the study

What if you want to stop before your part in the study is complete?
You can withdraw from this study at any time, without penalty.   The investigators also have the right to stop your participation at any time. This could be because you have had an unexpected reaction, or have failed to follow instructions, or because the entire study has been stopped.

Will you receive anything for being in this study?
You will not receive anything for taking part in this study.

Will it cost you anything to be in this study?
It will not cost you anything to be in this study.

What if you are a UNC student?
You may choose not to be in the study or to stop being in the study before it is over at any time. This will not affect your class standing or grades at UNC-Chapel Hill. You will not be offered or receive any special consideration if you take part in this research.

What if you have questions about this study?
You have the right to ask, and have answered, any questions you may have about this research. If you have questions about the study (including payments), complaints, concerns, or if a research-related injury occurs, you should contact the researchers listed on the first page of this form.

What if you have questions about your rights as a research participant?
All research on human volunteers is reviewed by a committee that works to protect your rights and welfare. If you have questions or concerns about your rights as a research subject, or if you would like to obtain information or offer input, you may contact the Institutional Review Board at 919-966-3113 or by email to IRB_subjects@unc.edu.

Participant's Agreement:

I have read the information provided above. I have asked all the questions I have at this time. I voluntarily agree to participate in this research study.

_____ _____

Signature of Research Participant   Date

_____

Printed Name of Research Participant

_____ _____

Signature of Research Team Member Obtaining Consent   Date
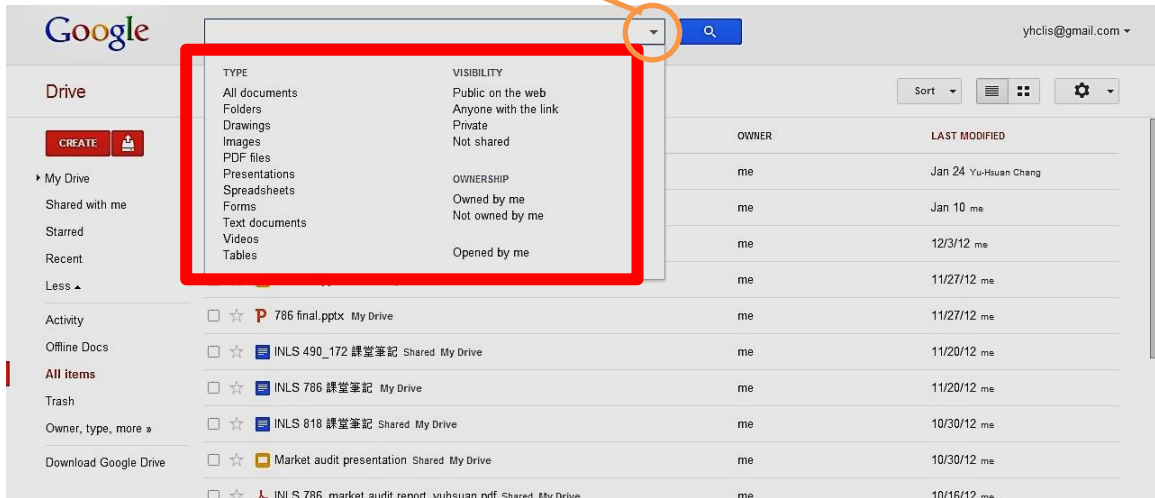

_____

Printed Name of Research Team Member Obtaining Consent

Appendix D: instruction sheet of questionnaire

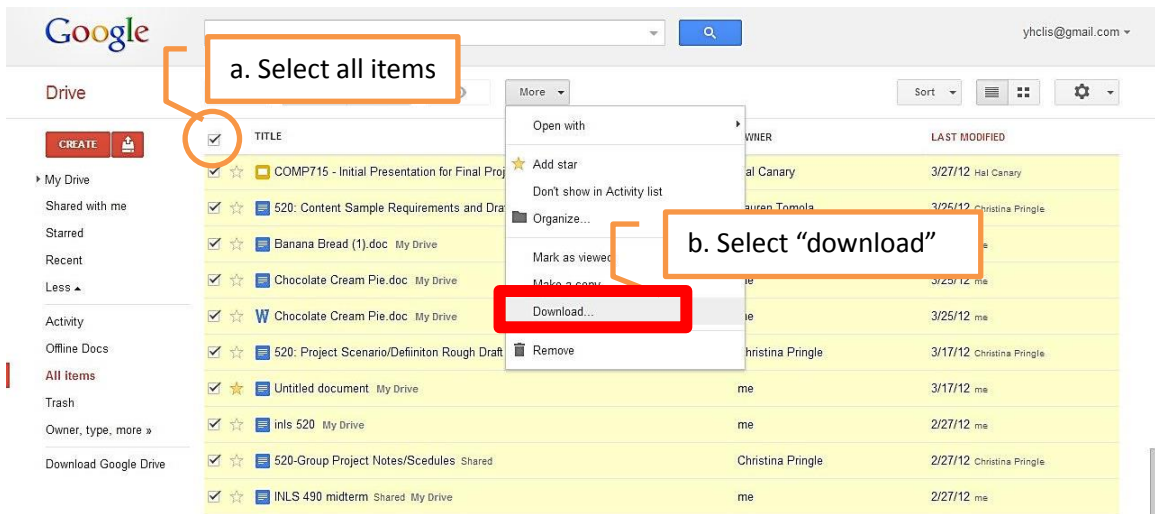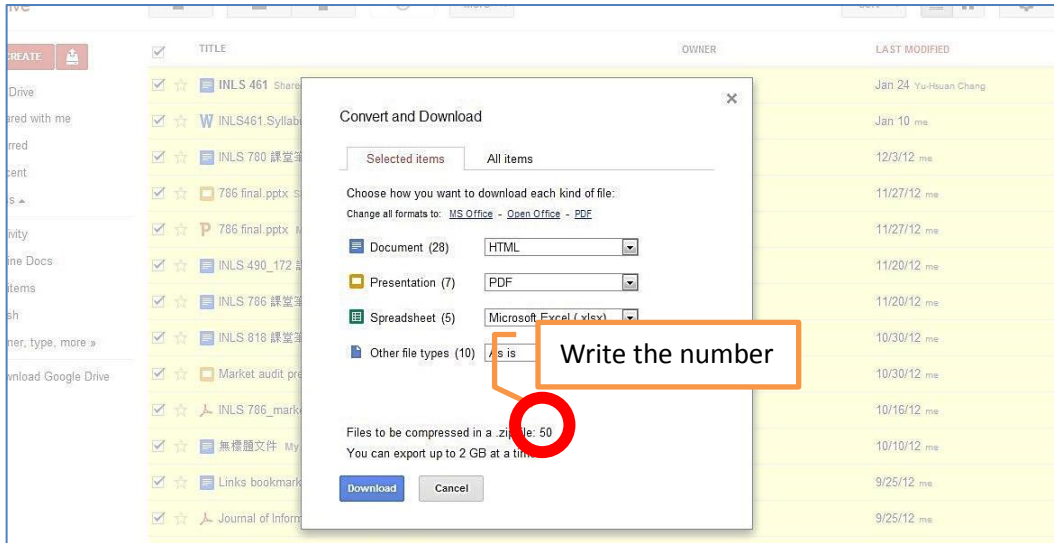## Instruction sheet of Questionnaire
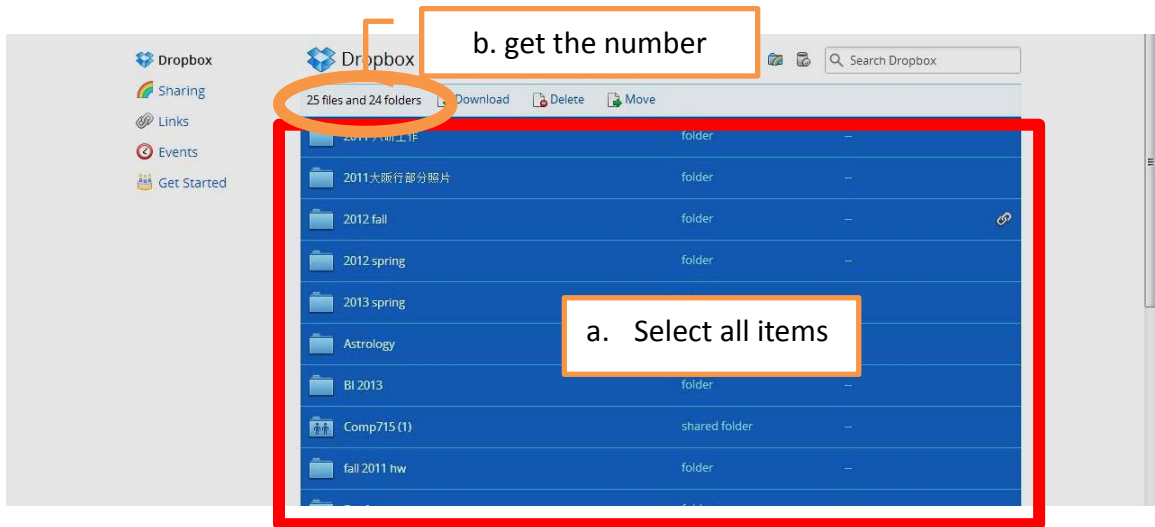
1. Google Drive

Click and get the list

a. Select all items

b. Select "download"

2. Dropbox

Shared items: check and count the symbol representing "shared"