

**My Multiple Life**  
**Personal Information Management across Different Computer Environments**

**Research Project Report**

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## **Abstract**

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Current research involving the use of personal information management tools have focused on people's organizational patterns in a very general sense. One important aspect that needs to be addressed is the diversity of people's lives. Current research does not take under consideration the different situations and environments in which people's organizational patterns may be different. How one arranges documents in one computer may be dissimilar from how it is arranged in another. The goal of this research is to investigate how people manage electronic information across different computer environments. Through interviews and observations, the organizational patterns of people's electronic documents, email and bookmarks on two different computer settings will be examined individually and then compared. The results can be used to develop better tools that support stability in the management of personal information across both the information forms and the environments that make up our lives.

## **Keywords**

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Information retrieval, personal information management, human-computer interaction, files, emails, web bookmarks, personal computing, maintenance.

## **Statement of Contribution and Benefit**

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Management tool development can improve tools to support multi-environment organizations. Companies and individuals can have easy access to information that matches our organizational patterns, making activities easier and more efficient.

# Table of Contents

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The Goal of the Research Project .....	1
Background and Significance .....	1
The Broad Impact of the Study .....	3
Research Methods and Design .....	5
Research Methodology .....	5
Research Design .....	6
Timeline .....	8
Research Participants .....	10
Characterization of Participants .....	10
Recruitment .....	12
Ethical Considerations .....	12
Results .....	14
Electronic Documents .....	14
Emails .....	15
Web Bookmarks .....	17
Information Form & Computer Environment Overlap .....	18
Discussion .....	19
Conclusion and Future Work .....	20
References .....	22
Appendices .....	24
Appendix A: Email Recruitment .....	24
Appendix B: Letter of Cooperation .....	24
Appendix C: Flyer Advertisement .....	24
Appendix D: Information Form .....	24
Appendix E: Questionnaire .....	24
Appendix F: Consent Form .....	24
Appendix G: Interview Protocol .....	24
Appendix H: Questionnaire Responses .....	24
Appendix I: Coding Scheme Template .....	24
Appendix J: Participant Coding Scheme .....	24
Appendix K: Filing Strategy Descriptions .....	24
Appendix L: Analyzed Data .....	24
Tables .....	25
Figures .....	26

## The Goal of the Research Project

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This research will investigate how people manage electronic information across different computer environments. It will examine how people organize their electronic documents, email and web bookmarks (cohesively referred to as *information forms*). Current research on personal information management (PIM) investigates how people organize information on a single platform (i.e., one home computer, work computer or laptop—hereafter referred to as *environment*). No research to date has taken a look at the breadth of people's computer environments. In this paper, I present a study in which I investigated how people manage electronic information on multiple information forms (electronic documents, email and web bookmarks) and across different computer environments. The objective of this research study is thus:

1. To examine how people organize electronic documents, email and bookmarks.
2. To determine whether some people organize information differently across different computer environment.
3. To examine the amount of overlap concerning people's organizational scheme across different information forms and computer environments.

If there is such a difference, then it will be of great interest for the designers and programmers of future information management tools. Such research can be used to develop better tools to support the management of personal information in a way that is stable across information forms and computer environments.

## Background and Significance

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Many research studies over the past 10 years have focused on the management of different organizational schemes within a user's computer workspace (Boardman (2001), Boardman (2002), Barreau & Nardi (1995)). While the research presented in this report concerns information management across different computer environments, the topic of information management is not a new one. In the rapidly growing information age, the question of *how can we effectively and efficiently organize information* has been a focal point in the study of digital information management. This question of effectiveness and efficiency has been a consistent theme throughout the various studies involving the

information management of email (Boardman (2002), Whittaker & Sidner (1997)), bookmarks and electronic documents (Boardman (2002), Barreau & Nardi (1995)). Specifically, in relation to electronic documents, it started roughly around 1995 when Barreau and Nardi conducted research that transformed the research area from information management of physical paper documents to the study of information management on the computer. They claimed early on that different people organize their electronic documents differently, and that it is important to understand the users to understand how designers can optimize information storage filing and retrieval.

As the information age evolved, newer information forms began to unintentionally create similar questions concerning information management. For email, Whittaker and Sidner (1997) stated that the use of email had evolved to a point where it is now used for multiple purposes, including delivering documents, archiving, task delegation, scheduling and task tracking. Twenty email users participated in a study where they were interviewed on how they organized and managed large amounts of email information. It was found that most problems occurred when users attempted to re-access information. Those who stored and filed emails quickly through some individually chosen management system encountered fewer problems than those who did not file. They recommended that email needs to be redesigned to support filing and task management functions, as well as a means of communication.

Boardman (2002) took the research further and began to study all of these various information forms together. He recognized that there was a great deal of overlap between the ways people organize their various artifacts independent of the information form being utilized. In his studies, the researchers viewed various participants' workspaces and analyzed how the different information forms (electronic documents, email and bookmarks) compared and contrasted and whether there were any underlying categories that remained stable across forms. This study showed that there is substantial overlap in the categories used as folder labels. In particular, Boardman points out that many individuals created folder labels that corresponded to various projects and roles that users were currently working on. Most of the overlaps in the email/bookmark and

document/bookmark sets were merely smaller subsets of the larger document/email overlaps. Thus far, the evolution of the study of information management has led to this point; there are so many information forms to manage aside from paper documents that it is becoming increasingly necessary to create a tool that allows users to manage these artifacts from one central management control.

All of these studies on electronic documents, email and bookmarks have followed the same procedural design; interview participants on their computer and analyze their organizational scheme. However, it is important to note that in today's age, people do not have only one central computer where they encounter various management and retrieval tasks. People are having to deal with multiple computer environments, including laptops, work computers, home computers, school computers, servers, etc. Studies conducted up to this point have not taken into consideration the context to which they are receiving their data. For example, Boardman's research involved participants showing the organizational scheme of what the participants specified to be their main file collection. It is unknown whether the individual has other computers by which they organize information differently for a different purpose. Perhaps their answers differ in that environment. It is unknown. The aim of the current research is to fill this gap that we feel is unaddressed in the present research.

## **The Broad Impact of the Study**

In today's technically driven society, information management has become a very important area of research. The implications of this research will help add to the framework for understanding how people organize information by understanding the context in which different situations and environments call for different organizational schemes. As stated earlier, current research on PIM in the computer desktop environment has focused greatly on the observations of how people organize information on their central computer. Though greatly important, what is lacking from current research is some consideration to the fact that many people today have multiple computer environments by which they interact with on a regular basis. The results obtained from

this study will help to enrich the research area that aims to understand how people organize information.

In addition to the enrichment of PIM research, of greater importance is the applied implications of this study to the way that personal information management tools are developed. The results obtained from this research have the possibility of influencing the development of information management programs and applications. A possible next step from this research is to investigate more thoroughly how these different computer environments truly compare and contrast to each other, and whether it is possible to create user-specific taxonomies that can remain stable across different organizational schemes on different computer environments. This represents one of the primary goals of the current research area: to find a way to integrate the different information forms to create a personalized taxonomy that would represent the storage of an individual's information, independent of the information form. Current research is being done to achieve such a tool. However, the implications of this research would claim that such tools would have to also provide support across different computer environments as well.

This research would be of great interest to companies such as Microsoft, Yahoo! and any application software or operating system that calls for the storage and retrieval of multiple forms of information in multiple computer environments. Again, as more people begin to own multiple computers for multiple purposes, it will be important to study these individuals and their behavior so to prepare the tools for such a working environment. Such tools will have to compensate for the many situations in which a single individual may require different organizational schemes due to varying circumstances.

The business workplace will also see benefit, if such research is considered in the application of PIM tools. Corporations and businesses can utilize such tools to increase efficiency of work within their employees. For those employees who are required to work at home and at work can benefit from such tools. As people strive to manage their information, this research can help to understand what personal information management

tools are necessary to compensate for the various ways people organize information across environments.

## **Research Methods and Design**

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### ***Research Methodology***

**Comparison.** Of interest is whether or not such a behavior exists that people's organizational techniques are generally stable across different environments. To address this, people's organizational schemes were analyzed across two different computers on three different information forms. People's organizational scheme using one information form in one computer environment (i.e. edocuments on the desktop) were compared to the same person's organizational scheme using the same information form in another environment (i.e. electronic documents on the laptop).

The three information forms studied in this research were electronic documents, email and bookmarks. These information forms were chosen due to their extensive roles in any given project or task. In the progression of an assignment, project or class, it is highly likely that in the completion of these various tasks, people will 1) create electronic documents that relate to the underlying project, 2) email and communicate with different team members or coworkers of the project, and 3) conduct research and save web pages that relate to the project.

An analysis of the similarities and differences between the organizational schemes and forms on one computer were assessed and compared to the schemes on a separate computer. Studying two computers is believed to be adequate enough to understand whether or not people do differ in how they organize information in a different computer environment. This will allow for a general analysis on two different computer environments to be conducted that will address the research question. Ten participants and their computers were desired to be recruited for this study. The data collected will allow for preliminary data to offer support for the research question. It is an adequate number that is enough to make a number claims about various issues and behaviors that people may encounter.

**Qualitative and Quantitative.** Quantitative data was collected through initial questionnaires that were given to the participants. Because it was important to understand the full context to which an individual utilizes one computer environment over another, data was collected on their information management background, satisfaction, usage and general background with the different information forms and computer environments. It was anticipated that these were the most probably factors that would influence how a person organizes different artifacts. To ensure that we obtain quality rich data, qualitative data was collected through interviews conducted with the participants as they showed the interviewer their organizational schemes. This was a very important aspect of the research; the majority of the data was collected from the interviews. They were conducted in such a way that the investigator was able to view users' organization schemes both from an outside perspective and the perspective of the participant. As they were being interviewed, they were asked to talk aloud their own description of their organizational schemes. This allowed the researcher to examine how they describe their own management systems and whether their statements agree with what they actually do.

### ***Research Design***

The design was split into two phases. The first phase involved filling out a questionnaire. The second phase involved two interviews in a location specified by the participant.

1. Participants who show an interest in the study through any of the recruitment methods was contacted by phone or email (see *Appendix A, C* for a complete email dialogue between researcher and participant and various other recruitment methods, including a sample flyer template). At that time, they were given more in-depth information on the purpose of the study. The purpose of this contact was to see if they initially qualify (participants must use multiple forms across different environments) and to determine whether they were truly interested in participating fully in the study.
2. An email was sent giving the participant the following: 1) an active internet link to the initial screening questionnaire (*Appendix E*) and 2) a request for an interview at the participant's convenience. The questionnaire was located at an online questionnaire site <http://www.surveymonkey.com> and was only accessible to those who were given a personalized, active internet link by email. The questionnaire took

no more than 15 minutes. Once the data was received, we proceeded with the second phase of the procedure (see *Appendix A, B* for full email dialogues). It is important to note that the primary objective of these emails was to create a trustful relationship between the researcher and possible participant. When the interviews begin, it was important that by that time, the participant was comfortable sharing information with me and talking about themselves to me. The success of the research was dependent on the idea that these participants were complete control of the study, and that their opinions and privacy were at their full control and discretion. Such a relationship was the best way to obtain rich and valid data from a participant. They had to have realized, before the interviews began that confidentiality was guaranteed, their opinions mattered to us and that they were in control of the interviews.

3. In cases where interviews were conducted in an employed working environment, the participant was asked to provide the researcher with the contact information for their immediate supervisor. A phone or email contact was made with the supervisor concerning the study. The procedures were explained and the name of the employee was disclosed as stating that he/she had volunteered to participate in the study. They were granted access to the results but all data was held confidential. A letter of cooperation was requested from the supervisor and a template of such a letter was emailed to them. It was to be returned to the researcher or participant prior to the interview being conducted (see *Appendix B*). It was important that this step be taken in order to secure the protection of the participant from any unnecessary problems that may have evolved from the participant being interviewed in the workplace. A supervisor must have agreed to the interview and had to be informed of what would become of the data and any rights promised to the participant by the researcher. In doing so, the rights of the participant, researcher and company were protected.
4. The first interview was conducted with the participant's first computer environment. It was of great importance that the interviews be conducted in the primary physical working environment of the computer. The reason for this was so that 1) the researcher could get a general idea of the broad context to which the computer was being used, and 2) the participant would feel more comfortable in their own environment rather than some designated area. Prior to the interview, the study and

methodology were briefly explained orally to the participant. The consent form outlining the full extent of the remainder of the study was given to the participant to sign (*Appendix F*). The participant had the choice whether to agree to be audio recorded and/or be contacted later for follow-up questions if necessary. The interview was conducted by the researcher who was following a loose script that provided a set of written instructions and explanations that was to be given in the same manner to every participant (*Appendix G*). The interview began when the participant was ready, at which time the participant was asked to provide a guided tour of their organizational schemes on each different information form. The participant was asked to speak aloud as they gave the tour. The first interviews took no longer than one hour (approximately 15 minutes per tour and general questions). A second interview was scheduled within one week of the first interview to allow a break for the participant from the study.

5. The second interview was conducted at the location where the participant's second computer environment was located. Prior, the participant was reminded of the study, methodology and consent form that s/he had signed. The interview began when the participant was ready at which time the participant was asked to provide a guided tour of their organizational schemes on each different information form. The second interview took no longer than one hour. Screenshots were to be chosen by the participant to give to the interviewer. The participant was thanked for their time. The maximum time expected for the participant's involvement in the study was totaling three hours over a two week period.

### **Timeline**

Presented here was the general timeline of this study in the context of the course. This timeline is an accurate representation of the course of the research process, which took approximately 20 weeks to complete.

Term 1	Deadline	Project Work
0 (12/05–1/03)		<ul style="list-style-type: none"> <li>• Solidify idea.</li> <li>• Talk with KFTF</li> <li>• Preliminary Literature Review</li> </ul>
1 (1/04–1/10)		<ul style="list-style-type: none"> <li>• Discuss topic with class</li> </ul>

		<ul style="list-style-type: none"> <li>• Get feedback from peers</li> <li>• Discuss topic with the Professor</li> <li>• Overview the research process</li> </ul>
2 (1/11–1/17)		<ul style="list-style-type: none"> <li>• Review research projects</li> <li>• Literature review</li> </ul>
3 (1/18–1/24)	<input type="checkbox"/> 1/20/04; Deliverable 1 due. Revised Research Proposal	<ul style="list-style-type: none"> <li>• Continue revising research proposal</li> <li>• Continue with research review</li> <li>• Talk with KFTF about research</li> <li>• Talk to Ammy about pilot studies</li> <li>• Finalize article list</li> <li>• Finish Deliverable 2: Literature Review</li> </ul>
4 (1/25–1/31)	<input type="checkbox"/> 1/27/04; Deliverable 2 due. Literature Review	<ul style="list-style-type: none"> <li>• Review methodology of the researchers</li> <li>• Continue literature review</li> <li>• Review Human Subjects Application</li> <li>• Think about procedures and research design</li> </ul>
5 (2/01–2/7)	<input type="checkbox"/> 2/3/04; Deliverable 3 due. Research design	<ul style="list-style-type: none"> <li>• Review how to conduct a research study</li> <li>• Analyzing data</li> <li>• Work on Human Subjects Form</li> <li>• Prepare URP Application</li> <li>• Work on abstract ideas</li> </ul>
6 (2/8–2/14)		<ul style="list-style-type: none"> <li>• Think about research design</li> <li>• Prepare Human Subjects Form</li> </ul>
7 (2/15–2/21)		<ul style="list-style-type: none"> <li>• Finalize Human Subjects Form</li> <li>• Prepare email templates</li> <li>• Prepare study materials</li> <li>• Finalize procedures</li> <li>• Ethical Considerations written out</li> <li>• Submit Human Subjects Application</li> </ul>
8 (2/22–2/28)		<ul style="list-style-type: none"> <li>• Review and prepare for study</li> </ul>
9 (2/29–3/06)		<ul style="list-style-type: none"> <li>• Begin preparation for Deliverable 4</li> <li>• Write-out relevant material</li> </ul>
10 (3/07–3/13)		<ul style="list-style-type: none"> <li>• Finalize Deliverable 4</li> </ul>
11(3/14-3/20)	<input type="checkbox"/> 3/16/04; Submit Deliverable #4: Research Project Report	

<b>Term 2</b>	<b>Deadline</b>	<b>Project Work</b>
0 (3/21–3/27)		<ul style="list-style-type: none"> <li>• Prepare materials for study sessions (instructions, tapes, equipment, etc.)</li> <li>• Conduct and analyze pilot study</li> <li>• Adjustments based on study and analysis</li> <li>• Recruit and schedule study participants</li> </ul>
1 (3/28–4/3)		<ul style="list-style-type: none"> <li>• Conduct study sessions</li> <li>• Transcribe data from study sessions</li> <li>• Analyze study data</li> <li>• Finalize Data Presentation Deliverable #5</li> </ul>
2 (4/4–4/10)	<input type="checkbox"/> 4/6/04; Submit Deliverable #5: Data presentation	<ul style="list-style-type: none"> <li>• Conduct study sessions</li> <li>• Transcribe data from study sessions</li> </ul>

		<ul style="list-style-type: none"> <li>Analyze study data</li> <li>Start Conference Paper Deliverable #6 draft</li> </ul>
3 (4/11–4/17)		<ul style="list-style-type: none"> <li>Prepare materials for study sessions (instructions, tapes, equipment, etc.)</li> <li>Finalize pilot studies and final adjustments</li> <li>Recruit study participants</li> <li>Schedule study participants</li> <li>Draft Conference Paper Deliverable #6</li> </ul>
4 (4/18–4/24)	<input type="checkbox"/> 4/20/04; Review Draft Deliverable #6: Conference paper	<ul style="list-style-type: none"> <li>Conduct, transcribe and analyze sessions</li> <li>Complete Conference Paper Deliverable #6</li> </ul>
5 (4/25–5/1)	<input type="checkbox"/> 4/27/04; Submit Deliverable #6: Conference paper <input type="checkbox"/> 4/27/04; Submit Informatics Capstone Event materials	<ul style="list-style-type: none"> <li>Conduct, transcribe and analyze sessions</li> <li>Complete Conference Presentation Deliverable #7</li> </ul>
6 (5/2–5/8)	<input type="checkbox"/> 5/4/04; Submit Deliverable #7: Conference presentation	<ul style="list-style-type: none"> <li>Analyze study data</li> <li>Complete Conference Poster Deliverable #8</li> </ul>
7 (5/9–5/15)	<input type="checkbox"/> 5/11/04; Submit Deliverable #8: Conference poster <input type="checkbox"/> 5/14/04; Participate in URP	<ul style="list-style-type: none"> <li>Analyze study data</li> <li>Complete URP presentation</li> <li>Complete URP poster</li> <li>Complete Informatics Capstone poster</li> <li>Complete Informatics Capstone presentation</li> <li>Practice oral presentations</li> <li>Practice poster presentations</li> </ul>
8 (5/16–5/22)	<input type="checkbox"/> 5/18/04; Submit Deliverable #9: Conference participation; Informatics Capstone Event	<ul style="list-style-type: none"> <li>Complete analysis of study data</li> <li>Start Research Project Archive Deliverable #10 draft</li> </ul>
9 (5/23–5/29)		<ul style="list-style-type: none"> <li>Complete Deliverable #10 draft</li> </ul>
10 (5/30–6/5)	<input type="checkbox"/> 6/1/04; Review Draft Deliverable #10: Research project archive	<ul style="list-style-type: none"> <li>Complete Deliverable #10</li> </ul>
11(6/6–6/12)	<input type="checkbox"/> 6/8/04; Submit Deliverable #10: Research project archive	

## Research Participants

### ***Characterization of Participants***

Ten participants, ages 18-65, were drawn from following groups: college students, researchers and other information specialists. It was expected that participants from different groups would provide unique and complementary perspectives on personal information management.

**College Students.** Undergraduate and graduate college students made up the largest group of participants. College students were selected for several reasons: 1) College students are generally younger and more likely to receive (and be receptive to) the full benefit from improved tools and techniques of PIM. Their habits are not likely to be set as of yet. 2) College students are often experiencing the challenges of life as an adult – including the challenges of PIM – for the first time in their lives. Given that their habits are not set, they were most likely be a group that was trying to deal (or has recently dealt) with PIM, and their data would be beneficial to the study.

**Researchers.** Whether in government, business or academia, they are consumers of information in large quantities. Researchers need to balance their time and attention between a large number of projects. A university professor, for example, may, at any point in time, be involved in the completion of several different articles, perhaps for different research projects. The professor may also need to teach several courses and maintain involvement in several committees.

All participants had to have utilized different information forms (electronic documents, email and web browser bookmarks) with relative frequency and must use them in different computer environments (i.e., a home computer, work computer, school computer, laptop, etc). They had to use or have at least two email accounts. Participants had to have signed a consent form that granted permission for the researcher to view the participant's use of their information forms.

In the end, The 10 participants were comprised of six students and four researcher or professionals. All participants were from the University of Washington with degrees including Informatics, Psychology, Linguistics and Japanese. The study included four female and six male participants. Nine participants ranged from ages 20-29 (1 participant ranged 40-49). Each participant had been using their computer environment between 1 to 4 years, and they considered themselves intermediate and expert computer users. The interviews were conducted on 6 laptops, 6 desktops, 2 work desktops and 2 school

computers.<sup>1</sup> Operating systems included 18 Windows XPs and 2 Mac OSs. Web browsers included Internet Explorer (14), Mozilla (6) and various others (6) (however, many confessed to switching between browsers on the same computer environment). Email client applications also had much overlap, and included the UW email website (12), Outlook (13) and various others (9). Each participant's computer environments and email domains were used for separate, distinct purposes. Participants received no incentive for their participation.

### ***Recruitment***

Participants were recruited through three means: (1) word of mouth, (2) through emails sent to listservs, and (3) through flyers. Word of mouth was done with individuals with whom I was in contact with. Listservs, emails and flyers were sent and posted on various student email sites, listservs, high traffic locations and blog forums. In all cases, the study was described and my contact information was provided for the individual to reach me for more information on the study and/or to participate.

### ***Ethical Considerations***

Small psychological stress and discomfort may have resulted from the interview process. Participants may have felt pressured to answer certain questions or may have felt uncomfortable talking about certain information that may have been sensitive to the participant. Realization of one's own organization (or lack thereof) may have caused mental distress as well. Invasion of privacy was also an issue as the participant may have had fear of showing a stranger their personal information. Screen shots were to be taken which may have left the participant uncomfortable sharing views of their personal information. There was also a small risk of injury to the participants who were interviewed in their work environment. Participants may have gotten in trouble with their supervisors for disclosing their organizational schemes to the interviewer at work (thus possibly showing sensitive work-related files to the interviewer).

In general, to address these risks, the participant was put in complete control over all information discussed and shared throughout the study. Participants were reassured

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<sup>1</sup>Due to particular circumstances, two participants did not complete phase two of the study. However, their data for phase one was still utilized in this study.

several times throughout the study (i.e., in the initial email, information form, the questionnaire, the oral instructions, consent form and during the interviews) that they were in complete control as to their involvement. They were informed that they were free to take a break or quit at any time. They could refuse to answer any questions that may have made them feel uncomfortable in any way, show the interviewer as much or as little information as they wanted, and have full control over the screen shots that they gave to the interviewer. The researcher was also aware of the body language and vocal tone of the participant and pulled back questions or statements that the interviewer felt may make the participant uncomfortable. It was also important to develop positive relations with the participant so that they felt comfortable speaking. They were told that they had control over all audio recording. No identifying characteristics were linked to their audiotape or transcript and the tapes were destroyed once transcribed. They were also promised that no identifying characteristics would be published by the investigator. Lastly, the participants were free to ask any questions at any time during the study.

For those participants and their supervisors and/or company, interviews did not take place if the company did not provide a letter of cooperation that stated that they acknowledged the interviewer's presence and agreed to cooperate under the terms of the study. They were granted access to the results of the study, but were never granted access to the transcripts, audiotapes or session notes. Employers had to agree to the terms in order to proceed with a participant's participation. (See *Appendix A, B* for email dialogue and the letter of cooperation template).

Participants had full discretion over the information that they provided. If anything was said or discussed that the participant did not want to be published or analyzed, then the investigator concurred to the participant's request. In those cases where the investigator felt that any information given may be sensitive, then I informed the participant of this concern and asked whether the participant would like for the information to be removed from the analysis. Any possible discretion found was discussed with the participant.

## Results

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Methods of organization, maintenance and retrieval differed considerably across both the participants and each of their individual computer environments. Many participants confessed that one organizational system is different in one environment than the other (*“The structure here isn’t as laid out as it is at home”*). All interviews have recently been completed, and the following are results on the three different information forms based on data collected and analyzed.

### **Electronic Documents**

**Organization and Maintenance of Electronic Documents.** Overall, it was found that out of eight participants, five of the participants changed filing strategies across their different computer environments (see Figure 1). On one of their computer environments, many participants expressed strong personal attachments about keeping the files that they have (*“I rarely delete anything. Why delete it? Besides, I’ll probably need it one day.”*). However, on another computer, a different attitude was seen to be held; many participants did not embrace the same concern about similar files (same participant: *I don’t care about these files...It’s the work computer*). For one participant, this did not coincide with what she considered to be her primary computer (*“My work computer is beautifully organized. But...my personal computer’s a mess!”*). Over the 16 electronic document environments that were analyzed, there was a wide variety of filing strategies found (see Table 1). Of interest is the fact that out of the total number of environments, inconsistencies were found when participants spoke of their computer environment. A total filer in one environment stated *“If it’s not filed, it bothers me;”* however, in this participant’s other work environment, he stated, *“This is my cleanup folder,”* meaning the participant often dumps many files into one folder and organizes it at a later time. In this environment, he was classified as an occasional filer. These are clear cases where there are two different computer environments with two different filing strategies.

There were also differences found with how participants chose to organize their information on different computers. Five of the participants chose to organize documents in completely different ways on their two computers. One of the participants dislikes

documents on the desktop of her school computer, but does not like to clutter the desktop on her laptop. On his home computer, another participant has file hierarchies five levels deep but insists on keeping everything at work at the root of his *My Documents* folder. While the organization was seen to be consistent across different computers for the remaining three participants, they all stressed the importance of one over the other (“*This is probably more organized than that, because this is my working computer. That’s my archive*”).

**Retrieval of Electronic Documents.** In terms of the re-access of electronic documents, of interest is the number of people that expressed satisfaction with the way they organize their electronic documents. This is true across all environments, regardless of the organizational scheme implemented in each computer. In general, participants rated their satisfaction of their organizational systems as being fairly high (4 on a 6 point satisfaction scale). In their questionnaire responses, 14 out of 16 environments were rated high in satisfaction. Furthermore, when asked how organized they considered themselves to be, they verbally rated themselves fairly high. On questions concerning their ability to find electronic documents, all but one participant stated that the frequency by which they are unable to find documents is less than once a week.

## ***Emails***

**Organization and Maintenance of Emails.** Overall, it was found that out of seven participants, five of the participants changed filing strategies across their different computer environments (see Figure 2). Over the 15 email environments that were analyzed, filing strategies were split evenly across all the environments (see Table 2). Once again, of interest is the fact that out of the total number of environments, inconsistencies were found when participants spoke of their computer environment. A frequent filer in one environment stated “*the inbox is like a small calendar to me,*” indicating that this person only had a small number of messages in his inbox to keep track of his activities. However, in this participant’s other computer environment, he stated, “*when this is full, I’ll delete it.*” The participant would not delete emails unless his account was getting full. In this environment, he was classified as a spring cleaner filer.

These are clear cases where there are two different computer environments with two different filing strategies.

All participants used folders to some extent to organize their emails; however, most did so irregularly. For six of the eight interviewed participants, folders were primarily a place where participants would archive emails. This occurred under situations where either 1) the participant decided to clean through his/her inbox (6 participants) or 2) once receiving the email, the participant would automatically archive it (2 participants). In both cases, folders were rarely checked subsequently (*"This is maybe the first time I've been in this folder since I made it"*). Aside from the default folders (i.e. sent mail, trash, drafts), the number of folders ranged from two to ten.

Differences were also seen in the way people organize emails across their different email accounts. The most significant difference was seen in the amount of emails that participants keep and delete. In one email account, some participants acknowledged that a lot of the emails they receive are unimportant, but they keep them despite not need them. Some are kept for practical purposes (*"I need to keep these for work, but I don't necessarily need to read them"*) and some simply forget about them (*"It looks like there was a skiing trip last February. Well, big deal!"*). When asked whether this participant would delete the email, she replied, *"Why? It's off the radar screen. I don't see it."* This question received a different response in a different email account (*"I just delete them when I see I don't need them"*). This was primarily due to the state of the tool, primarily a concern about web space. Six of the eight participants interviewed stated that they were worried about email space (*"I won't normally delete stuff unless I'm low on space."*). Many stated that if it were not for space, they wouldn't delete emails.

**Retrieval of Emails.** Two primary techniques were seen regarding how participants retrieved emails, and both have to do with how their emails are organized. The first involves those who keep most of their emails in the inbox. For these individuals, satisfaction was fairly high (4 in the 6 point satisfaction scale). These individuals are the ones who would find emails by first looking chronologically backwards through their

inbox, using their memories to find who sent it and when. These individuals also use the sorting features to find emails (*"I'll sort my emails by person"*). The other individuals are those who keep separate folders for different types of emails. These individuals are the ones who logically think through about what it is they are attempting to retrieve (*"This email was from him, so it's probably in this folder"*). For these individuals, satisfaction averaged out to be the same as the previous group. Interestingly, both groups expressed their satisfaction for their own technique and their dissatisfaction for the other (*"I can't organize things in folders, because I would have to go through and check each of them for an email. This way, it's all in my inbox"*) (*"I want to be able to group things in folders so that I can know that everything for this string of emails is in this folder. It makes it easier"*). Overall, 13 out of the 16 total email environments were rated as medium to high satisfaction on the questionnaire.

## **Web Bookmarks**

**Organization & Maintenance of Bookmarks.** Overall, it was found that out of eight participants, five of the participants changed filing strategies across their different computer environments (see Figure 3). Over the 16 bookmark environments that were analyzed, filing strategies were split fairly evenly across all the environments (see Table 3). Once again, of interest is the fact that out of the total number of environments, inconsistencies were found when participants spoke of their computer environment. An extensive filer in one environment stated *"I don't like things all scattered,"* stating that he liked things organized all under the favorites menu. However, in this participant's other computer environment; he was classified as not filing at all. He stated on many occasions that he had *"no idea what this is."* Two different environments showed a great deal of inconsistency in terms of how they organized information on two different computers.

The number of bookmarks per computer environment ranged from five to 166. As far as behaviors went, only under certain circumstances would participants actually rename their bookmarks. Many bookmarks titled *untitled* or *home page* were found on their computers (*"I have no idea what this is, and probably couldn't tell you"*). Regardless of the content of the bookmark, it was of interest that many participants would not delete

unnecessary bookmarks. On one of the computer environments, many participants stated that they hold many bookmarks that they simply don't need (*"Like this folder: I probably won't need these links anymore"*). Regardless, many of the participants insist that they keep the bookmark anyways (*"Well, you never know. I guess I'll keep them around"*). For most participants, the only bookmarks they stated that they would delete are the ones that are no longer available.

**Retrieval of Bookmarks.** Regardless of the different ways that the participants organized their bookmarks, satisfaction for all participants was fairly high in both computer environments (4s in a 6 point satisfaction scale). Participants stated that they regularly find the bookmarks that they need if they are in search for them. However, many participants admitted that they don't bookmark sites nor use them as often, because of how simple it is to simply type in what it is you are looking for in either a search engine or the address bar (*"It's much easier for me to just go to Google and type it out and find what I'm looking for"*).

### ***Information Form & Computer Environment Overlap***

For each individual participant, there was a very large degree of overlap concerning the content of the files being created on both the different computer environments and information forms. Similar class folders and files were found in both computers' electronic document filing systems across all participants. This was also true in terms of the information forms. Many emails, bookmarks and bookmark folders had information pertaining to one topic, project or job (*"I had to find my file on the computer so that I could send an email to my boss to look it over"*). Similarly, five participants transformed one form into another in order to keep track of them. For example, instead of creating bookmarks, one participant created a text file with all the links; instead of searching through an email for important information, one participant created a text file with a copy of the email text; instead of depending on a word document on their home computer, one participant sent the document as an attachment to herself.

Furthermore, the data suggest that an individual's different computers are not fully mutually exclusive. Many of the same documents and the same type of documents were

utilized in both computer environments (*“This 370 folder is the same 370 folder I have at home”*). Many participants expressed the desire for this type of dispersion (*“I think it’s safer to save multiple copies on different places”*). However, this also added much difficulty for many (*“Because I was working on two computers, I once overwrote one of my files with an old version from another computer”*). One participant never trusted any files kept on one of his computers (*“This computer is completely dispensable. I don’t trust any of the files on it. I move every file in here to my home computer, and delete all these files”*). This lack of trust in their documents was a reoccurring theme for at least four other participants.

## **Discussion**

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The results presented in this paper suggest that the behavior exists where people do organize information differently on different computer environments. While this paper does not discuss the reasons as to why this was so, many participants hinted at the social role that they had and how the computer played into and was utilized by that role. Many pointed fingers to the role that the different computer played in their lives (*“This is work. I don’t care about this,” “This needs to be organized because of work” or “This laptop is a work space for my home computer, so I don’t need it as organized”*). Regardless, these were still computers that held many files for the participants for them to utilize.

Furthermore, as stated earlier, a large degree of overlap was seen across the different computer environments. Similar files and bookmarks on similar topics were seen to exist in both environments. In terms of the development of tools, perhaps people would benefit from having centralized repositories of files and bookmarks. In terms of email, Microsoft Outlook already offers some of this centralization. In Outlook, individuals are able to bring together different email addresses into one application and access them all in this manner. Perhaps this is one step into a greater concept of information management across different computer environments. Centralizing files and bookmarks to customizable desktops accessible in many different computer environments may be a solution. While further research is necessary to investigate this idea, the importance of it is still strong, in that the fragmentation of information exists on people’s computers when it does not have to.

However, under all information forms, all the participants had generally expressed at least medium degrees of satisfaction in the organizational system that they developed. Some participants don't mind that documents are all on the desktop in one computer and organized in another. Both organizational systems work for them; for some they do not. This also begins to suggest an interest thought: if participants are satisfied, why are we trying to fix it? It was found that many participants found or created certain tricks with their current organization schemes that helped them find information. Thus, they felt satisfied with what they currently implemented. With this in mind, further research should be done to see *who* the individuals who suffer from poor information management and, and centralize focus on them. This research suggests that some people do not need help; perhaps we shouldn't fix what isn't broken—at least to these individuals.

## **Conclusion and Future Work**

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The results presented here are preliminary results that suggest, at the very least, the importance of studying different computer environments. The research does suggest differences in organizational schemes. This study offers current behavioral analysis concerning the situations in which those behaviors occur, and further research should be conducted to analyze this further. It may suggest that newly developed information management tools, however they are developed, need to take into consideration the computer usage and restraints that the user defines for his/her computers environments. This research suggests that users may have a system of their own that “works” due to the environment and context to which it is used. This information can be used to further understand the situations in which an individual's use of personal information management tools may differ given the computer working environment they are in.

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## References

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- Boardman, R. (2001). Multiple hierarchies in user workspace. CHI 01 : ACM SIGCHI Conference on Human Factors in Computing Systems : Student Poster Session, Seattle, Wa., ACM SIGCHI.
- Boardman, R. (2002). Workspaces that work : towards more effective personal information management. Proceedings of HCI 2002 : People and Computers XVI : Memorable Yet Invisible : HCI 2002 Doctoral Consortium at the 16th British HCI Group Annual Conference, London.
- Boardman, R., Sasse, M. A. ""Stuff goes into the computer and doesn't come out" A Cross-tool Study of Personal Information Management." Unpublished.
- Barreau, D., Nardi, B.A. (1995). "Finding and reminding: file organization from the desktop." ACM SIGCHI Bulletin **27**(3): 39-43.
- Boardman, R., M. A. Sasse, et al. (2002). Life beyond the mailbox : across-tool perspective on personal information management. CSCW 2002 Workshop: Redesigning Email for the 21st Century, New Orleans, La., ACM.
- Cole, I. (1982). Human aspects of office filing : implications for the electronic office. Proceedings of the Human Factors Society 26. Annual Meeting, Seattle, WA, Human Factors Society (HSF).
- Dourish, P., W. K. Edwards, et al. (2000). "Extending document management systems with user-specific active properties." ACM Transaction on Information Systems **18**(2): 140-170.
- Freeman, E. and D. Gelernter (1996). "Lifestreams: A Storage Model for Personal Data." ACM SIGMOD Record (ACM Special Interest Group on Management of Data) **25**(1): 80-86.
- Jones, W., H. Bruce, et al. (2001). Keeping founds things found on the web. Proceedings of the ACM CIKM '01, 10th International Conference on Information and Knowledge Management, Atlanta, Ga., ACM.
- Jones, W., H. Bruce, et al. (2003). How do people get back to information on the web? How can they do it better? INTERACT 2003: proceedings of the 9th IFIP TC13 International Conference on Human-Computer Interaction, Zurich, Switzerland.
- Jones, W., S. Dumais, et al. (2002). Once found, what then? : a study of "keeping" behaviors in the personal use of web information. ASIST 2002 Annual Meeting, Philadelphia, PA., American Society for Information Science & Technology.

Lansdale, M. (1988). "\*The psychology of personal information management." Applied Ergonomics **19**(1): 55-66.

Malone, T. W. (1983). "How do people organize their desks : implications for the design of office information-systems." ACM Transactions on Office Information Systems **1**(1): 99-112.

Whittaker, S., Sidner, C. (1997). Email overload: Exploring personal information management of Email.

## **Appendices**

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All appendices are hyperlinked to the original documents.

[\*Appendix A: Email Recruitment\*](#)

[\*Appendix B: Letter of Cooperation\*](#)

[\*Appendix C: Flyer Advertisement\*](#)

[\*Appendix D: Information Form\*](#)

[\*Appendix E: Questionnaire\*](#)

[\*Appendix F: Consent Form\*](#)

[\*Appendix G: Interview Protocol\*](#)

[\*Appendix H: Questionnaire Responses\*](#)

[\*Appendix I: Coding Scheme Template\*](#)

[\*Appendix J: Participant Coding Scheme\*](#)

[\*Appendix K: Filing Strategy Descriptions\*](#)

[\*Appendix L: Analyzed Data\*](#)

## Tables

Table 1: Filing Strategies of Electronic Documents and the Number of Environments

Filing Strategy	Total # of Environments (n=16 environments)
Total Filer (most items filed on creation or soon; frequent management)	5
Extensive Filer (many unfilled, duplicate, loose organization)	4
Occasional Filer (filed occasionally, most duplicate, unfiled on high level folders)	7

Table 2: Filing Strategies of Email and the Number of Environments

Filing Strategy	Total # of Environments (n=15 environments)
Frequent Filer (File/Delete Inbox messages daily)	5
Spring Cleaner Filer (Periodic Inbox filing and deleting)	5
Filter Filer (Inbox/Filters, both Frequent and Spring Cleaner)	5

Table 3: Filing Strategies of Bookmarks and the Number of Environments

Filing Strategy	Total # of Environments (n=16 environments)
Extensive Filer (File as created or end of session)	5
Sporadic Filer (Filed irregularly, most on top folder, some folders abandoned)	6
No Filer (Hardly filed, many folders abandoned)	5

## Figures

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### Figure Captions

Figure 1: File Management Change across Different Computer Environments

Figure 2: Email Management Change across Different Computer Environments

Figure 3: Bookmark Management Change across Different Computer Environments





