

Seeking an ideal solution to the management of personal information collections

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Abstract: This paper reports on the observation over time of 20 participants engaged in working on personal projects. The goal of the study was to understand how people organize and structure a personal information collection. The data reported focus upon the steps that individuals take to change their personal information collections during the course of a project and the motivations for seeking a more ideal solution to their information management challenges. The researchers found that observing people over time as they find, select, collect, organize, and manage information for a personal project provides an excellent context for studying the challenges of personal information management (PIM). Participants changed the structure and organization of their information collections by adding new folders or new categories, increasing the number of separate piles for information, or adding tags. They collected more information for their project than anticipated and found that their initial plans for managing this information were inadequate. Some abandoned their collections while others faced the inadequacy of their information management strategies with resignation. When asked to design their ideal system for organizing and managing their information, participants in the study most commonly cited the need for greater integration of their information. Participants also often described the need for a system with human qualities - an intelligent automated “helper” that would “magically” solve the challenges they face with the management of a personal information collection.

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I. Introduction

These days many of us are challenged with the management of large and growing collections of personal information. Some collections are consciously created by us while other information seems to collect or perhaps accumulate of its own accord. We may deliberately collect articles, books, magazines, recipes, songs, pictures, etc. and we can have gigabytes of stored information representing our e-mail messages, electronic documents and various other files. This may include large numbers of references which point to still more information on the Web. Add to this the large amount of information we retain in paper forms (books, statements, titles, bills, newspaper clippings, magazines, printouts.) and it is true to say that our personal information collections are growing in diversity and complexity and the challenge of managing these collections is affecting our daily personal and professional lives.

The concept of a personal information collection is not new. Indeed, many years ago when Bush (1945) first introduced his notion of a MEMEX, he was describing the development of a “mechanized private file and library” where “an individual stores all his books, records, and communications...an enlarged intimate supplement to his memory.” At the time, Bush was describing a vision for a personal collection of information that an individual could access whenever need arose. In more recent years, the concept of a personal information collection has been described using terms such as personal information environment (Kwasnick, 1991; Malone, 1983) and information space (McKnight, 2000). Bates has described the inclination of individuals to carve out a subset of the “information world” in a personal information collection through the metaphor of farming (Bates, 2002). In Bates’ metaphor, people “farm” information because they want to reduce the effort of information seeking. The collecting of information sources and channels is analogous to farming because we “tend” the collection by organizing its materials for later use. Put simply, we are constantly challenged to take charge of the information that we need for work, fun, and everyday decisions and tasks. In response to this challenge, individuals create a personalized subset of the “information world” that they can use when they are faced with information needs. This subset of the information world is a personal information collection.

Personal information collections are also a worthy candidate for study in our efforts to understand how people go about completing personal projects. At any point in time, most of us are working on several different projects. Some of these projects are work-related (e.g., “complete annual report”); some projects are not (e.g., “buy a new car”). Some of our projects are part of a larger project involving other people (e.g., “submit a plan for re-structuring my group as part of the larger company re-organization” or “get legal advice as part of my work on the board of directors for our condominium”). These projects are “personal” to us because they are important to us and because we are responsible. The projects won’t get done without us. Sometimes we have help and are mostly doing the planning and supervision. At other times, we may be doing everything from start to finish. Personal projects in our lives often involve information in several forms—paper documents, electronic documents, e-mail messages, and several forms of Web information (conventional Webpages, blogs, wikis, etc.). And personal

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projects often last for weeks or months from start to finish. Personal projects are, therefore, potentially a manageable unit of analysis for the larger study of personal information management (Jones, 2007).

The project complements the task as a unit of analysis. Although the definition of a task is by no means fixed, the task as defined in recent studies (for example, Bellotti et al., 2003, 2004; Czerwinski et al., 2004; Gwizdka, 2002; Wolverton, 1999) has been relatively short in duration and with minimal internal structure. For example, a task such as “Synch Pocket PC” (Czerwinski et al, 2004) can, we would hope, be completed in a single effort and with no need to decompose the task into subtasks. Tasks are often represented by entries that a person might make in a to-do list as reminders, to be checked off when the task is complete. By contrast, the project is a larger unit that is usefully decomposed into sub-projects and individual tasks. Projects involve planning. Projects have a duration of several days to several months (or even years). Projects involve several forms of information. In a study looking at how people organize different forms of information (files, e-mail messages and Web references) Boardman and Sasse (2004), for example, found that projects were a common basis for creating and naming file folders. Projects, sometimes the same projects, were also frequently reflected in the choice of e-mail folders. But, perhaps more commonly, as Bergman et al. (2006) discovered in another study, information relating to a project was “fragmented” across very different organizations—one for documents, another for e-mail messages and another for Web references. A study by Jones et al. (2005) revealed that the structure of subfolders under a project folder often served multiple, albeit ad hoc, purposes in a person’s efforts to manage a project. Subfolders were, for example, a reminder of tasks to be done as well as a means of grouping the information needed to complete these tasks.

2. The Study

The study described in this paper takes an additional step in the study of personal information management (PIM) by looking at how people manage different forms of project-related information as projects unfold and are completed over a period of time. How do project-related collections of personal information change over the course of a project’s planning and completion? With these collections as a reference point, what problems of PIM do participants observe? What support would participants like to see?

3. Method

3.1 Sampling

A recruitment announcement was posted on Craigslist seeking participants for the study. This announcement informed prospective participants that the researchers would be interviewing them about the way they organize project-related information in its various forms. It also stated that there were no specific criteria for participation but encouraged students, researchers and information professionals in particular to contact us using a WebQ form. A flyer was also produced and posted on the University of Washington Seattle Campus to attract the participation of students. This flyer also pointed the potential student participants to the WebQ form.

Expressions of interest based on the Craigslist announcement and the campus flyer were followed up by an e-mail contact and then an initial telephone interview. Selected participants were then asked to fill out a short online questionnaire and a convenient time and location for the initial interview was identified.

Data describing the participants is summarized in Table 1. The study recruited 20 participants: 8 females and 12 males. These participants ranged in age. Eight were between 20–29; six were between 30–39; four were between 40–49; and two were 18 years old. The participants were students and teachers, software developers, designers, administrators, and librarians.

Note: Participants in this study are a subset of participants in a larger study whose provisional results are described elsewhere (Jones et al. 2009). The additional participants of the larger study were not able to commit to the longitudinal, three-interview regimen described in this paper. The focus in this paper is on changes that occurred over time and, as such, this includes data for those participants who were able to participate in all three interviews.

3.2 Data collection

The first contact with each participant in the study was a short interview conducted over the telephone or in a brief (ten-minute) meeting. The goal of this brief interview was to identify projects that the participant was working on and to select one of these projects as a focus for the remainder of the study. Participants were asked to list up to seven projects they were currently working on and would be comfortable talking about. The researchers were looking for a project on this list that was relatively new to the participant and would likely be worked on and completed in the six to eight weeks following this initial contact.

After initial contact to establish a project of focus, participants were interviewed on three separate occasions over a period of six to twelve weeks. Each interview lasted for 60 to 90 minutes and was scheduled to take place where the participant most commonly worked on the selected project. For some participants this was their place of work; for other participants this was a home office. In each of the three interviews, the researcher then asked a series of questions about how the participant managed and used information related to the project. These questions were focused upon four primary forms of information: paper documents, electronic documents, e-mail messages and Web references. Questions aimed to understand the roles that information in each of its forms played in the planning and completion of the project. At the end of each interview, the participant was asked, “If you could custom order a tool that would allow you to manage your information related to this project in any way you liked, what would that tool allow you to do?”

During the second and third interview, the participant was asked how the project was progressing and to describe any changes that may have occurred in terms of the methods used for managing information related to the project. These changes included alterations of structure, constraints, requirements, tools, timelines or other factors that may have affected the management and progress of the project. Participant were asked again about their approach to the management of paper documents, electronic documents, e-mail messages and Web references created, collected and organized for the project.

Participants were paid \$15 per hour for their time. All interviews were audio recorded.

3.3 Data analysis

The interviews for each participant were fully transcribed. Members of the research team independently read through each transcript noting themes and techniques that emerged from the first and second interviews and changes or consistencies with the approaches used for information management by participants in the study. Members of the team then met to discuss their independent analysis of the data. In these research team meetings the reliability of the analysis conducted by each team member was verified through discussion and cross-checking.

Through several iterations of this process, the researchers developed the themes and working definitions for their coding of the transcripts. The definitions were regularly challenged, and new codes were developed, as properties within the transcripts emerged through team discussion. In this way, the researchers used the constant-comparison technique introduced by Glaser and Strauss (1967), comparing the categories and codes of new transcripts with existing categories and codes in order to more fully develop the properties that they were identifying. The research team followed this process until no new codes or categories emerged.

4. Results

The results reported in this paper focus upon two key elements of the study. First, since the interviews sampled the state of a project and its information on three separate occasions (with interviews separated from one another by several weeks), it is possible to observe changes in a project and in the management of project-related information collections. Second, participants were encouraged to draw upon their experiences with the selected project to describe an “ideal” system of PIM. Sample participant responses and a categorization of these responses are also reported.

Table I: Participant Information

Participant #	Gender	Age	Profession	Project
AG-184	F	20-29	User Experience Researcher	Organizing coupons to help save money.
AP-123	M	30-39	Software Developer in Test	Testing new advertising targeting software
BK-129	M	18	student	Training for a triathlon
CB-152	M	40-49	Video Game Designer	Switched projects during the study. The first project was a children's video game based on "Where the Wild Things Are;" the second was a first-person shooter game ("SOCOMM 6,").
EF-130	F	20-29	Family Services Manager for a large international housing charity	Coordinating a number of local charitable organizations to facilitate cooperation between them to better serve the needs of their constituencies.
EK-126	F	20-29	Administrator	Participant Recruitment: was in charge of recruiting 40 autistic children and their families for a university genetic research study
ET-156	M	20-29	Software Developer	Making an interactive (electronically-enhanced) stuffed animal, in collaboration with his girlfriend
EW-191	M	20-29	Nonprofit Worker (at a nationwide children's outreach organization)	Arranging a group visit for children and their mentors to see the children's incarcerated parents
JS-182	F	20-29	Special Collections Librarian	Learning the procedures for her new job as a library accessioner
JS-197	M	40-49	Network Technician	Planning a trip to visit a friend who is living in Japan.
JS-199	M	30-39	Doctoral Student (English)	Organizing a Summer Institute Course, in collaboration with 3 faculty members

Participant #	Gender	Age	Profession	Project
KX-208	F	<18	Undergraduate Student	Preparing for a study abroad in Amsterdam. This involved planning the actual trip and coordinating with other students in her group to plan their research while in Amsterdam.
MA-187	F	40-49	doctoral student	Preparing the reading lists for a General Exam
MP-149	M	30-39	Part-time Executive Masters degree student & Full-time Systems Administrator	Planning for a masters degree capstone project
SC-193	F	30-39	Substitute Teacher	Compiling and assembling a memory book for recently deceased grandfather
SC-226	M	20-29	Fly Fishing Guide	Designing monthly e-newsletters for employer, a fly fishing outfitter
SD-200	M	40-49	System Administrator	Planning Star Wars game campaign
SE-147	F	20-29	Undergraduate Student	Preparing a 3-image print suite, depicting past, present, and future images of women
SR-196	M	30-39	Systems Analyst	Locating and compiling paper and electronic resources collected over ten years into a single resource guide for a role playing game
SX-215	M	30-39	Software Developer	Converting paper files to electronic files

Selected projects ranged widely (see Table 1). Some were for work (e.g. designing a monthly e-newsletters for an employer, a fly fishing outfitter); some were not (e.g. planning a trip to visit a friend who is living in Japan). Some involved other people (e.g. organizing a Summer Institute Course, in collaboration with three faculty members); some involved only the participant (e.g. preparing the reading lists for a general exam).

4.1 How personal information collections change during the course of a project

As stated earlier, the researchers were particularly interested in observing what happens over time to a collection of information designed to support an individual's work on a project. To what extent, for example, is the structure set up by the individual for organizing the information for a project based upon a prediction of need (Bruce, 2005). Sometimes these predictions are very accurate and the individual is able to develop a collection of information that matches the future need perfectly. More often, it is the case that these predictions fall short and the structure for organizing information in a personal collection must be altered over time to adjust to the practices of re-finding and using the information for the project. We wanted to explore this further. The data describing the changes occurring in the organization of the participants' collections during the course of the observed project appear in Table 2.

Table 2: Themes of change in participant projects and project-related information collections.

Theme	# of participants	Examples
Initial denial of change	12	"Um, but, no I haven't really done anything new as far as creating new folders or anything, um..." –SC-226 "It's all the same." –SE-147
More organization	15	"larger hierarchy ... rules going to them." –AP-123 "I've made a folder for links and bookmarks." –BK-129 "I renamed those so that they'd be next to each other." –SX-215
Consolidation	7	"I've locate[d] everything I could find. And, now they're actually in one directory." –SR-196
More information	15	"...there's some more information than there was, uh, three or whatever weeks ago since we last talked." –SD-200

Theme	# of participants	Examples
Deletion	5	“there is an ambiguous pile somewhere in my condo which is now gone.” –ET-156 “I threw away a big stack of papers that I identified as not needing” –SX-215
Abandonment	5	“It didn’t serve the purpose I was hoping it would...so I just sort of bagged this for now.” –EF-130
Feeling more in control	4	“Not really, except that I feel, I feel...like I have it a little more under control.” –MA-187
Learning	5	“So I’ve done the same kind of thing before and I’m getting better at organizing... sub-folders, I used to not ever make them ” –JS-199
External validation	5	“I started needing to look like a professional and being self-reliant and resourceful and I think I’m -- those are still sort of the driving elements and principles behind it.” –CB-152

When asked if anything had changed in terms of the organization of the collection of information used to support the project, 12 participants in the study initially responded that no changes had occurred. When probed further, however, it became clear that most of these participants had changed their collections in some way. For 15 of the participants, changes meant more organization for their personal information collection, such as adding new folders or new categories, increasing the number of separate piles for information, or adding tags. For 7 of the participants, this meant organizing their collections into fewer piles and consolidating their original categories.

For these participants, the general structure that they had originally devised for the personal collection of information for the project held up to some extent over time. The initial choice of organizational method may have been based upon past experience or a structure that had been used for an earlier project completed by the participant, but as the collection grew and folders were added, the underlying structure remained basically the same. As participant MP-149 stated: “I’ve added some folders and a whole bunch more documents, but really the, the basis where there’s, uhh, a project folder and everything goes into that, that’s local, has stayed the same.”

As we observed our participants working with their projects over time, 15 reported that they have more information than they had anticipated would be needed. Their collections were growing to support their work on the project. Where this was the case, the initial structure designed to organize an anticipated smaller quantity of information proved unsuitable for managing the larger quantity ultimately needed. Participant MA-187 for example stated, “it’s become more clear to me that order matters” and participant CB-152 reported, “Yeah. I was wrong about the sort of initial structure that I assumed it was gonna take.”

For 5 participants the solution to having more information in the collection than originally anticipated was simply to delete information that could not be supported by the initial structure or would not be needed for work on the project. But for another 5 participants in the study, their failure to accurately anticipate the volume or complexity of information needed for the project led them to abandon the systems that were created to organize the information collection, because they were deemed inadequate. A comprehensive description and analysis of the forms of system abandonment observed in this study can be found in Jones, E., Bruce, H. et al. (2008).

The motivation to change the organization of a collection of information for a project was often related to how the participant “felt.” For example, participant MP-149 reported that he would add tags to information in the collection, “when it gets cluttery or when I get panicky.” Six of the participants “felt” more organized as their project progressed simply because they had more room to organize the project information – a new desk or a larger office. For example, participant EF-130 stated, “Yeah, well I just feel more organized. I think because I’m not under all that clutter...So I feel more focused now here, I feel like I have one thing that I’m doing and then I can move on and not have all this paperwork everywhere.”

Six of the participants in the study felt more organized because their understanding of the project developed over time and this meant that they acquired increased confidence in the systems they had developed for organizing their information collection. For these participants, the progression of the project and the effective organization of the information collection needed to complete the work just “felt good.” Four of the participants reported that it “felt good” to have a sense of mastery or control over the collection of information needed to complete the tasks of the project and it “felt good” to be organized. As participant MA-187 stated, “...it appealed to the piece of me that...likes to be organized and...it had an end point, it was like, ‘Oh look, now it looks nice’...I was like, ‘oh good, I can get this done...I know where things are.’” Six of the participants reported that it “felt good” to have learned more about the organizing of information for the project at hand. As participant SE-147 stated, “I’ve learned from mistakes I made on the first one to the second one.”

Of course, the motivation for changes in the way participants organized and managed the information for a personal project varied significantly. But, an interesting observation that the research team made was that the 5 participants were very conscious of the external perception of their ability to organize information. For these participants, this concern about external perception played a role in how conscientiously they pursued the goal of effective management of their personal information collection. Participant CB-152 summed this up by stating, “I don’t want to live like a goober. Cuz I get paid pretty well as a senior LD, and they have a couple of juniors and I just can’t be, you know, perceived to be less competent than they are. [...] I don’t want to look like a goober. That’s pretty much it. I have to act like [a] pro.”

There were, of course, practical reasons for this focus on appearances when it came to working in collaboration with others. Where the project was a group project, participants developed the organizational appearance of their project’s information collection so that they could more effectively collaborate with their partners.

4.2 How ideal is your method for organizing and managing your personal information collection?

When asked how close to ideal their existing system was for organizing and managing the information collection for their project, participant responses fell into several categories (see Table 3). Six of the participants were simply resigned to the deficiencies that they observed; a typical initial response to this question is summed up by participant AG-184, “It’s pretty close. The thing is I don’t have a better idea at this point. So it’s as good as I can conceive of right now.”

Table 3: Ideal methods for organizing a personal information collection

Theme	# of participants	Examples
Integration	16	“ideally I would have like a unified system, I wouldn’t have all these different databases and all these different check lists and manuals”...“something that unified all of the separate tools and databases that I use” –JS-182 “..maybe go from media to media a little bit better, ...if I store something out on the wiki, it will also store something on, in the, in the file structure.” –AP-123
Helper	9	“I’d like to have a staff...search that stuff for me. And the staff could apply all the extra effort to make my organizational system perfect.” –SR-196 “I’d like to, you know, hire a couple of gnomes to come in and do it for like, you know, bread and water.” –SX-215 “Or if I had like, uhh, minions.” –SX-215
Super search	4	“So I could say oh I want this instead of you know just searching a bunch of text files and doing pattern recognition it can actually go through my apartment and find stuff that matches that.” –SR-196
Group Information Management	8	“it would allow me to, um, enable twenty-four people to research a single project or idea, um, feedback on each other’s work, but also be able to, I guess for lack of a better word, individuate it, um so, you know, I’ve got these notes and you’ve got these notes, but I can comment and vice-versa...enabling some kind of collaborative writing component.” –JS-199
Memory	7	“Remember everything!” –CB-152 “I just want, you know, to have this integrated like workspace where I can keep track of things I want to remember. Things to do, calendar.” –JS-182
Automation	13	“What I would really love is something that took voice to text and that parsed topics by priority and that parsed items by priority and topic. So I would just say something like – and this is me talking. This is somebody with a bad memory talking. I would say uh, ‘Arrival needs to have the effects tweaked.’ ... and I would say, ‘Priority 5 (out of 10).’” –CB-152
Resignation	6	“I’d have to say that, um, yeah it’s the, it’s the best that I can manage based off of, uh, the amount of effort I want to put into it.” –SR-196

Because our research observed participants over time, it became apparent that most learned more about their needs for information and the shortcomings of their initial methods for managing and organizing this information during the course of working on their projects. It often became apparent to the participant that their initial plans for managing and organizing information for their projects were not ideal but that making changes was not desirable either, because of the effort now required to amend their initial design. As participant CB-152 explained, “I would say it’s 35% of how I would like it ideally. ...there’s still a lot of legacy from what I thought my ideal layout would be. It’s not the way that my initial layout would be because of flaws in my initial layout and just the rapid turnover of information – my initial layout couldn’t handle it.”

A common theme observed for 16 of the participants was their desire for software or tools that would integrate the information formats in the collection they created and used for their project. Most participants used information to support their projects that came in the form of e-mails, electronic documents, Web pages and printed documents. In many cases these different formats required a different method for organization and varying techniques for re-finding the information when it was needed for the project. Four participants reported not being able to search across information formats or observed that they have good searching and re-finding capability for digital information but lacked an equivalent capability when it came to

paper documents. They wanted a common structure for the various formats of information that comprised their personal information collection and they wanted this structure to be automatically generated. Their ideal would be a comprehensive, intelligent search capability.

Many participants simply needed help. They no longer wanted to face the challenge of managing the information for their project alone. Eight participants described their ideal in terms of an automated system that would do everything for them. This automated system would have the “intelligence” to understand what they needed, even to anticipate these needs without an explicit command and to structure or re-structure the information according to the goals of their project. As participant CB-152 stated, “It’s like the...system would have to be me plus”...“to say what it was that I wanted to say – like and in my own vernacular, ...with my own shorthand and have that be broken out concisely into topics that relate to other topics because they all do.”

When faced with the question of what would be ideal, 9 participants found that the best way to describe their needs was in the form of a personal helper, sometimes with magical qualities. This personal helper would anticipate their needs, collect and manage the information that they would use for their project, find this information and help the participant use it when and wherever it was needed. As participant SR-196 summarized, “my ideal set up would be not me actually doing the work.”

A number of the projects that participants were doing involved other people either at work or partners at home. For 9 participants, their ideal for organizing and managing the collection of information for their project was described in terms of group information management. They wanted their ideal to provide the capacity for independent and collaborative work on the project, access to the work that others are doing, and security from the dilemmas of lost data, version control, etc.

Another common theme was memory. Seven participants reported their need for a system in their personal information collection that would help them remember the information needed, where it was, and how to re-find. This memory enhancer would also provide a facility to keep the project on track and on schedule.

5. Conclusion

In conclusion, the researchers found that observing people over time as they find, select, collect, organize, and manage information for a personal project provides an excellent context for studying the challenges of personal information management. It is over the course of a project that individuals set goals for a personal information collection and find out how well this collection meets their needs. While people work on a project, they learn through degrees of success or failure, the merit of decisions made about collection structures and they develop a deeper understanding of the impact of choices that they have made about the information needed for a project and how it will be accessed and used. In this context, individuals have a reference point for judging the value of alternative methods of collection organization and the cost and benefit of changing their original plans. The researchers were able to observe how personal information collections change. They were also able to probe the question of what might be regarded as ideal. It is difficult to come to a clear statement about what is ideal, unless

of course we are presented with a real example of what is not ideal. In the course of building and managing a collection of information for a project, participants in this study found that the outcome was less than perfect. They used this observation as the context for explicating what might be an ideal personal information collection.

The data from this study support a number of observations that the researchers have accumulated during the course of their numerous studies related to the challenges of personal information management. Effective management of a personal information collection, whether it be for the purpose of supporting a project, a professional role, personal choices and decisions, or a pastime or hobby, is challenging for most people. We are all limited by our abilities to accurately predict the information that we will need over time for any tasks that occupy our interest. Our memories fail us when we encounter a need for information and we forget that we have the right information for this need in a personal information collection. We organize our collections in an effort to make the information in them visible and accessible to ourselves. The structures we impose are often designed to prompt our memories or convince us that we have established control over the information that we need. And yet, we spend time searching for information that we have previously encountered or found, but have forgotten where we placed it. Our collections of information have fragmented structures because information we find useful comes in different formats, and the systems that we have at our disposal fail to integrate these formats or to provide a unified method for searching. On top of this, the sheer volume of information for which we are responsible keeps growing, and our sense of accountability to ourselves and others for good information management convinces us that we are failing. It is little wonder that the participants in this study who face the challenges of personal information management seek the ideal of an intelligent human assistant for an automated system that will “magically” solve the challenges they face with the management of a personal information collection.

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