

Organizing personal digital information: an analysis of faculty member activities

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Abstract

Purpose – The objective of this paper is to document and analyze the organizational activities of faculty members using a personal information management (PIM) framework developed by Jacques (2016).

Design/methodology/approach – Interviews were carried out with seven faculty members, focusing on their personal information organization practices as they relate to their academic activities. These interviews took the form of a guided tour of informants' digital workspaces.

Findings – Analyses focused on PIM activities make it possible to identify the different strategies adopted by faculty members to organize their academic personal information. This qualitative approach highlights four activities involved in the organization of personal information: inclusion, exclusion, apprehension and implementation. It also reveals differences in the ability of faculty members to analyze their own practices. Finally, the relationship to time and memory of PIM practices is examined through the lens of the concepts of virtualization and actualization.

Originality/value – This research provides a more nuanced understanding of PIM practices, specifically of organizational activities, by considering the meaning of these practices for individuals as part of their daily lives. It aims to foster literacy by facilitating the interactions of individuals with their personal information through educational activities.

Keywords Personal information management, Qualitative research, Information behavior, Faculty members, Information organization practices, Personal information systems

Paper type Research paper

Introduction

Individuals in today's information society face many challenges. Whether for personal or collaborative projects, for work or leisure, they must make considerable efforts to manage this wealth of information in order to achieve their goals. In particular, the ability to record information and organize it in a meaningful way for future retrieval has become a crucial issue. While a large part of this organizational work could be previously carried out by information professionals (librarians, archivists, administrative assistants, etc.), the ubiquity of personal computer tools and the networking of these devices have transferred a larger part of this work on the shoulders of individuals who must now manage and organize personal digital information collections by themselves. This work is crucial because it affects vast numbers of "resources" in individuals' daily lives. Glushko (2015) defines resources as "an ordinary sense of anything of value that can support goal-oriented activity. This definition



means that a resource can be a physical thing, a non-physical thing, information about physical things, information about non-physical things, or anything you want to organize” (p. 42). Such information resources allow individuals to carry out the various projects of their daily lives (Jones, 2008). This organizational work is a complex task for individuals who face different challenges related to the continual evolution of digital information spaces, an increased number of resources (Whittaker and Sidner 1996; Fisher *et al.*, 2006), the fragmentation of these resources across multiple devices and across different contexts of use (Jones and Bruce, 2005) and the increasingly shared nature of some of their collections (Kljun and Dix, 2012; Zhang and Twidale, 2012). These different trends increase the likelihood for individuals to experience difficulties in understanding their digital collections (misunderstanding, waste of time, etc.) or even more serious problems, such as the outright loss of important information.

With such complexity, two answers are possible. The first, which has been the most prevalent so far, is the development of applications to simplify the management of personal information collections or to automate this work (e.g. Bauer *et al.*, 2005; Bergman *et al.*, 2019; Rodden and Leggett, 2010). The second, which complements the first, requires further investigation: the development of individuals’ skills to organize their personal information (Jacques, 2019; Kim, 2012; Mioduser *et al.*, 2008). These two types of responses imply a nuanced understanding of individuals’ daily PIM practices. At the heart of this is a thorough understanding of PIM activities: the main models presented in the literature distinguish different PIM activities, among which are organizational activities. This study breaks down organizational activities into its main core components and addresses their limitations. Specifically, it aims to return to the distinction proposed in Jacques’ (2016) matrix of four organizational tasks (i.e. selection, deletion, apprehension and implementation) developed in the context of student practices by applying it to the PIM practices of seven faculty members working in information studies or in the humanities and social sciences. By contrasting the activities and comments of students and faculty members, the main goal is to refine the understanding of information organizational activities within broader PIM practices.

Personal information management activities

Personal information management (PIM) focuses on how individuals manage information in the course of their daily and professional lives. Jones (2008) defines it as:

The practice and the study of activities a person performs in order to acquire or create, store, organize, maintain, retrieve, use and distribute the information needed to meet life’s many goals (every day and long-term, work-related and not) and to fulfill life’s many roles and responsibilities (as parent, spouse, friend, employee, member of community, etc.). PIM places special emphasis on the organization and maintenance of personal information collections in which information items, such as paper documents, electronic documents, email messages, web references, handwritten notes, etc., are stored for later use and repeated re-use (p. 5).

This research field thus sits within the broader area of information behavior studies, with a clear interest for everyday information behavior, and tries to embrace a holistic approach to the study of daily activities performed by individuals when interacting with information in all aspects of their life (Ocepek, 2018). Since the seminal article by Malone (1983) proposing to distinguish between two basic structures in personal collections—files for browsing and piles for identifying important documents—researchers have gradually started to look into PIM practices in paper environments starting in the 1980s (Cole, 1982; Suchman and Wynn, 1984). The field has since expanded to studying these practices in digital environments. Two trends have emerged (Diekema, 2012; Kim, 2012): an approach centered on tool development and an approach focused on describing user practices. In studies on practices, the analysis can focus either on the types of organizations produced (e.g. Barreau and Nardi, 1995; Bergman *et al.*,

2010; Henderson and Srinivasan, 2009) or on the different strategies adopted by individuals to produce these organizations (e.g. Alrashed *et al.*, 2018; Boardman and Sasse, 2004; Whittaker and Sidner, 1996). Some PIM studies have focused specifically on student practices (e.g. Hardof-Jaffe and Nachmias, 2013; Zhang and Liu, 2015) or on faculty members practices (e.g. Kwasnik, 1991; Trullemans and Signer, 2014), but when studied, these groups are often considered as overall information workers. This led to a focus on the classification structures produced and factors motivating their creation rather than on the very meaning of their information organization practices with regard to their broader student or professional lives. In doing so, this study is inspired by previous work on everyday information practices developed by Savolainen (2008) who advocates the importance of studying contextual factors and to consider individuals as social actors when they interact with information. As such, “[...] specific practices, composed by actions [...] become meaningful in the horizon of everyday projects and their constituent acts” (Savolainen, 2008, p. 26). Therefore, this research aims to complement previous studies with a dedicated focus on the PIM activities and strategies of faculty members in regard to the projects, goals and roles of their daily professional lives.

One of the central contributions of PIM is to have provided a better understanding of the different activities involved in personal information management, by clarifying some general concepts used until then in the modeling and description of the information behavior of users once the information had been found. General terms like “information use behavior” (Wilson, 2000), “information gathering” (Krikelas, 1983) or “information management” (Fisher *et al.*, 2005) did not accurately provide a clear distinction of the activities central to PIM. Two main models of PIM activities are found in the PIM literature: the “mapping model” and the “curation perspective”.

The mapping model of PIM activities

The mapping model (Jones, 2017) finds its origins in a PIM workshop that leads to PIM activities being viewed as an “effort to establish, use and maintain a mapping between needs and information” (Jones and Bruce, 2005, p. 11). To manage personal space of information (PSI), three categories of PIM activities were proposed:

- (1) “Keeping activities” affect the input of information into a PSI.
- (2) “Finding/re-finding activities” affect the output of information from a PSI.
- (3) “M-level activities” (e.g., “m” for “mapping” or for “maintenance and organization”) affect the storage of information within the PSI (p. 10).

Jones (2008) builds on this model several years later by providing the following definitions:

- (1) Finding and re-finding activities: “[...] a class of activities that all start with a need and move to information that, somehow and in some form, meets this need” (p. 62).
- (2) Keeping activities: “Decisions made and actions take to relate current information (information at hand under consideration) to anticipated needs” (p. 125).

In Jones’ proposed model, meta-activities complement basic activities: organizing, maintaining information for now and for later, managing privacy and the flow of information, measuring and evaluating and making sense of things. “Organizing” is intimately linked to “Keeping,” which Jones defines as “decisions made and actions taken in the Selection and Implementation of a scheme to relate the information items in a collection to anticipated needs” (2008, p. 125). This meta-activity is more concerned with the whole of the collection rather than discrete information objects therein.

The curation perspective of PIM activities

[Bergman and Whittaker \(2016\)](#) proposed a slightly different version of the first model with a three-stage approach:

- (1) Keeping: “the fundamental decision of whether to retain or delete the information that we encounter” (p. 2).
- (2) Management: related to how to keep information in order to retrieving it at a later time, which “may involve actively organizing information in certain ways to provide future retrieval cues that will enable us to reconstruct where information is located” (p.18). “By actively imposing order on kept items, users increase their ability to retrieve those items in the future” (p. 51).
- (3) Exploitation: “the process of retrieving information” (p. 21).

These two models offer alternative views of partially overlapping PIM activities ([Jones, 2017](#)). Both, however, refer to organizational activities by individuals of their personal information. The focus of this research is specifically on these organizational activities to better understand how individuals structure their collections in order to retrieve their information later. In particular, it was important to understand the different components of these activities and test whether it could be broken down into sub-activities. The first objective was therefore to understand what exactly it means to “organize”.

Information organization activities

Various authors have taken a specific interest in information organization activities within the PIM literature.

The personal information organization process

[Oh \(2013, 2019\)](#) developed the personal information organization process (PIOP). This model consists of six stages:

- (1) Stage 1: Initiation – initiation of the process when users save, create, receive or obtain a file;
- (2) Stage 2: Identification – identification of the file and some of its attributes;
- (3) Stage 3: Temporary categorization – temporary categorization of the file into temporary location;
- (4) Stage 4: Examination/comparison – examination by the users of its existing organizational structure to find an appropriate location to save the file, which implies a comparison between new and existing files;
- (5) Stage 5: Selection/modification/creation – selection of a relevant folder to save the file or modification of an existing folder or creation of a new folder;
- (6) Stage 6: Categorization – categorization when the file is finally placed into a folder.

This model is the first to have formalized the process of personal information organization within PIM practices. It proposes a detailed analysis of the stages, actions, thoughts and factor involved in the process of organizing personal information.

The “discipline of organizing” approach

[Glushko \(2015\)](#) proposes an analytical framework of the “organizing system”, which he defines as an “intentionally arranged collection of resources and the interactions they

support” (p. 34). He also distinguishes four activities or functions that occur naturally in organizing systems: selection, organization, interaction definition and maintenance:

- (1) Selection: “Determining the scope of the organizing system by specifying which resources should be included” (p. 98).
- (2) Organization: “Specifying the principles or rules that will be followed to arrange the resources” (p. 98).
- (3) Interaction definition: “Designing and implementing the actions, functions or services that make use of the resources” (p. 98).
- (4) Maintenance: “Managing and adapting the resources and the organization imposed on them as needed to support the interactions” (p. 98).

The concept of the organizing system was created by Glushko to overcome the opposition between information search and information organization. Glushko’s vision, which considers PIM as an organizing system, highlights what is meant by organizational activities within the practices of PIM:

- (1) It is closely linked to the work at the “margins” of collecting information resources that must be organized and is concerned with delimiting what is and what is not part of that collection;
- (2) This work at the margins is not exclusive to new information but applies also to collections that are no longer deemed relevant;
- (3) It requires good understanding of their characteristics and relationships and
- (4) It is based on the ability to grasp technical device affordances in order to create structures in collections for future browsing.

A matrix of competencies for personal information organization

Jacques (2016) studied students’ PIM practices with the aim of defining the skills specific to personal information organization within a set of PIM competencies. To identify these competencies, 58 interviews were conducted with students, as part of a guided tour (Malone, 1983) of their personal information space. The individual, semi-structured interviews were analyzed deductively, based on the frameworks of Jones (2008) and Glushko (2015). This analysis was complemented with an inductive approach, inspired by phenomenology (Marton, 1986) and grounded theory (Charmaz, 2006), to uncover individuals’ typical information practices by considering their lived experiences and the meaning they give to these practices.

The outcome of this analysis is a matrix of competencies for personal information organization. This model is an attempt to (1) complete and synthesize models of information organization and PIM activities in the literature; (2) produce a definition of personal information organization anchored in everyday information practice and (3) produce a framework suitable for educators wanting to develop educational activities related to personal information organization and PIM literacy. This matrix combines four activities (selection, deletion, apprehension and implementation) with three dimensions (social, informational and technical) and three relations (adequacy, optimization and virtualization) for the organizations created in an attempt to consider the intentions and objectives pursued by each individual. The four activities used in the matrix of personal information organization competencies are defined as follows (Jacques, 2016, pp. 355–356):

- (1) Selection: choosing the information that is part of the collection and saving it.

- (2) Deletion: choosing the information that should exit the collection and deleting it.
- (3) Apprehension: understanding information by perceiving their characteristics and putting them in relation.
- (4) Implementation: leveraging affordances and cognitive artifacts to describe and structuring information in ways that make it possible to interact with it.

This division into four activities proposed by Jacques was relevant to understand and analyze students' practices within the different theoretical frameworks proposed in the literature. It attempts to refine different PIM models and synthesizes Glushko's work. If this framework is relevant for the analysis of students' practices and describe their personal information organization competencies, there remain questions whether this distinction is relevant and appropriate to study PIM practices with other groups.

Research question

The objective of this study is to analyze personal information organization activities of faculty members by using the framework proposed by Jacques (2016). Specifically, it aims at consolidating and refining the distinction into four activities (selection, deletion, apprehension and implementation) used to describe personal information organization practices. While this division into four activities was appropriate to analyze students' PIM practices, it was important to apply this division to other contexts to validate the framework. To build on this, it seemed interesting to look into the practices of faculty members because their activities, objectives and roles, supported by their collections of digital information, appeared at first more developed, complex and varied and involved more documents over longer periods of time compared to students.

Time being a central dimension to PIM, the differences between these two groups warranted deeper scrutiny. Another aspect that appeared more developed with faculty members was the social dimension of various tasks and projects, evidenced by long-term sharing and joint-management of information. These gaps seemed to guarantee sufficient differences in practices to generate an interesting analysis and therefore test this theoretical four-activity model in another context.

This research also questions the ability of informants to analyze and describe their own practices by trying to distinguish different types of reasons they use to justify and rationalize them. More broadly, this study also aims at documenting personal information organization practices of faculty members by taking into account the context in which these practices emerge, as well as the projects, goals and roles which are shaping the professional lives of these informants.

Method

For this study, the exploratory data collection was inspired by Malone: "to obtain qualitative insights and compelling examples, not statistical proof of *a priori* conjectures, [which relies] more on the skill and insight of the observer to discover unexpected phenomena and illuminating examples in the human systems being observe" (1983, p. 101). In doing so, this research takes a qualitative approach (Lejeune, 2014; Patton, 2015) to analyzing PIM activities of faculty members in relations to their academic life. Semi-structured interviews were conducted with seven faculty members (adjunct ($n = 1$), assistant ($n = 5$) and associate professors ($n = 1$)) from a Canadian university working in various fields (information studies ($n = 4$), education ($n = 1$), history ($n = 1$), criminology ($n = 1$)). Only one participant was familiar with PIM literature. Participants were recruited through nonprobability voluntary and purposive sampling (Fortin, 2016). Recruitment across various fields and career stages

was done to ensure a diversity of practices and was stopped once saturation was reached. In-depth interviews and data saturation explain the small number of participants to produce a fine level of details.

This research project has been approved by the institution's Research Ethics Committee. The interview guide was pretested, and the interviews were recorded and lasted on average one and a half hours, focusing primarily on how participants organize their own professional information collections using their primary computer operating system. The interviews were complemented with a guided tour (Malone, 1983) by the informants of their personal information collection. All interviews were transcribed and analyzed using NVivo. The data were analyzed by combining deductive and inductive methods (Charmaz, 2006; Ligurgo *et al.*, 2018). A deductive analysis was done by coding interviews along the four PIM activities using the personal information organization matrix of competencies (Jacques, 2016). Through an inductive analysis combining grounded theory (Charmaz, 2006) and phenomenology (Marton, 1986) approaches, relevant codes have been added iteratively to nuance and question PIM activities as necessary.

Results

Faculty members information organization activities

From selection to inclusion. The first observation is that the faculty members interviewed make considerable efforts to select the information they wish to keep, or not, for later. This is due to the complex nature of their profession, which requires a lot of information gathering from various sources. In order to carry out their research or develop courses, they must keep abreast of specific topics, taking care to select resources that may be useful to them. P2 talks to the importance of this Selection: “[. . .] I have a pile of texts, things that I identify as potentially interesting as I discover them, to feed into my thinking [. . .] I kept them because they could be useful to me” (P2). Another faculty member explains: “When I have enough [. . .] I take all the links to different texts or different books and I put this in a file called “list of interesting links” (P6). Apart from keeping up with new publications, faculty members gather various sources of information for several aspects of their work (writing articles, applying for grants, marking student papers, committees work, etc.).

In Jacques (2016), student interviews had highlighted the importance of selection activity in choosing what is part and what is not part of personal collections. Some students made significant selection efforts to maintain restricted collections sizes, which ultimately allowed them to avoid having to rely on more complex organizational decisions. At the start of school, they were unlikely to produce documents themselves and therefore received or shared few documents with others. These uses were very present among some students but in a much smaller scale with faculty members. First, faculty members are more likely to produce new documents themselves. The regular production of conference papers and articles, teaching or attending meetings make way for the creation of documents (lecture notes, slides, reports, etc.) that are then added to their personal collection of information and for which several versions may be retained. Secondly, they are confronted with numerous documents or pieces of information sent to them and sent through different channels (emails, shared documents in the cloud, etc.). For example, a faculty member says: “[. . .] she sent it to me [. . .] by putting it in a file so that I could consult it” (P5).

These findings imply a redefinition of the initially proposed “Selection” activity, which suggested that this activity only referred to conscious and thoughtful decision-making in relation to documents encountered as a result of a search. The concept of “Inclusion” is proposed instead. Broader in meaning, it makes it possible to think more holistically about the different issues related to what “enters” collections considering the conscious selection of resources retrieved but also the creation of documents and the reception of information by

various incoming channels (emails, shared documents in the cloud, etc.). Therefore, as an activity, "Inclusion" is defined as decisions and actions taken to determine if information is part of the collection of personal information, whether as a result of a search for specific information, of the creation of original information or coming from incoming channels and shared spaces.

From deletion to exclusion. The practices of interviewed faculty members are strongly marked by archiving strategies. For example, one informant explains: "I have a Dropbox that serves as "documents in progress" and on that directory [...] I use "documents" for archives, for everything else that is inactive" (P6). This logic of archiving is frequently found when writing a paper or an article, where draft versions are kept in whole or in parts: "[...] I keep the versions, but I do not keep them all. Only those with significant changes" (P1). The same applies for documents related to teaching, specifically for courses that evolve yearly. P3 states: "But, if not, I always have "archives" which I use for past courses, in previous years" (P3). This archiving activity of inactive information is also found for email management.

If this archiving trend seems strong, in other circumstances, faculty members may have to delete some documents altogether: "So, there is not much in this because, at a certain point, when it's out of date, I erase them" (P2). It appears that these archiving and deletion activities are partly motivated by hard drive space limitations and not only to gain in intelligibility for "active" information. A professor adds: "For an email, I can erase it, because our mailbox has a maximum, in terms of volume [...] that I exceed systematically" (P2). The lack of space is also mentioned as motivation for archiving by another informant: "[...] it's a computer with a hard disk too small, so I'm running out of space. So, I have some of my things on an external hard drive that I also use to archive [...] things I use less [...] If I had room, everything would be only in one place" (P4).

The deletion and archiving practices of faculty members are very different from those of students, who essentially delete information they deem obsolete. For some students, this allows them to maintain small collections in order to be better able to make sense of them. For others, it was more about the constraints of technical devices with low storage capability. Few conscious archiving practices had been observed even though, in reality, some files served as archives without having been created out of a conscious reflexive process. This difference is explained by the fact that, at the beginning of their studies, students primarily organize resources related to their leisure and few have resources for which they have the unique copy. They are also confronted with small collections: for many students, university is the first opportunity to develop collection and organization practices for digital information. The age of these collections and the risk of clogging appeared to be relatively low for them.

As far as faculty members are concerned, moving these documents to dedicated spaces in order to unclutter active working spaces is preferred to the pure and simple deletion of documents. This may be explained by the fact that informants all had at least several years of experience behind them, including professional work. This experience has led to the accumulation, over time, of numerous documents, some of which are no longer associated with active projects. In addition, the academic work is by nature cumulative. Faculty members build their careers on evolving research clusters, through the accumulation and long-term exploration of knowledge in specific areas. Since previous work can serve as a foundation for future research, pure deletion seems unsuitable and presents a risk of losing valuable data that can be revisited later or used to document one's career. Finally, faculty members are more likely than students to provide evidence of their past activities: they must therefore keep track of everything they have done. For example, P6 gathers information related to different business trips: "I have to keep track of that because in the refund application, you have to provide the ticket, you have to provide the boarding pass, so everything is there" (P6).

These contrasting practices call for a redefinition of the deletion activity proposed by Jacques (2016). Rather than talking about deletion, the concept of exclusion is proposed. This term is broader and makes it possible not only to refer to the practices of total deletion of documents in a collection but also to consider archiving strategies that excludes from “active” spaces documents preserved “just in case” in the long term. Exclusion is redefined as follows: the removal of information that is no longer part of the active collection, completely suppressing information, severing incoming information flows, leaving shared spaces or by archiving inactive information into dedicated spaces.

Inclusion and exclusion activities rely on the distinction between active and passive areas within personal information collection. This distinction appeared multiple times in our interviews and is partially in line with the distinction proposed by Barreau and Nardi (1995) between three types of information (ephemeral, working and archived) in their study of the ways users organized and retrieved files on their computers. It is also in line with the distinction between hot, warm and cold documents (Sellen and Harper, 2002) within personal information collections.

Apprehending information. The apprehension activity is defined as understanding information by perceiving their characteristics and putting them in relation (Jacques, 2016). Faculty members must indeed make sense of a lot of information about the diverse and complex tasks and roles of their professional life. Most of the ones we met identified, as a foundation of their organizational process, different major “functions” in their profession: teaching, research, community service, institutional service, etc. For example, P6 explains: “And I separated them according to my professional duties: teaching, research, outreach, community service, and my working relationships as a professor” (P6). Directly inspired by their affiliated institution’s structure and missions, these major functions constitute the foundation of their professional collections and are, at a fundamental level, used to organize their professional lives.

These major functions are then refined in a series of subcategories related to their associated tasks and roles. While some categories seem more prevalent than others, such as the “Courses” files for teaching or various publication files in the case of research, there remains a diversity of categories involved. This is due to the independence of faculty members and the considerable leeway they have in shaping their professional life, in addition to, at times, the unstructured and nonsystematic nature of their tasks and of the roles they assume. This is one major difference with students interviewed by Jacques (2016) who, with the exception of a few large papers or projects, are mainly confronted with highly structured tasks, a structure they can emulate to organize their collection: a study plan, divided in semesters/quarters, for every course, further subdivided in assignments, units or learning objectives.

The complexity of the tasks and roles of faculty members further results in an important use of categories related to tasks supported by this information. These categories of activities embedded in the information collected allow them to manage what they are accomplishing. This is quite relevant to the management of writing projects, an activity central to academics. For example, P1 distinguishes between “articles to write”, “articles under review” and “completed publications”. P2 added “WIP” (that is, “work in progress”) to the names of some recurring publication folders, and P6 created a folder with “pending publications”.

Using different categories is also useful for managing different publication versions. P3 has a “final” file where she puts the final version of her articles. P5 adds a distinction between “track” for the working versions and “clean” for the final versions. Likewise, P6 explains: “when it’s written “version”, that’s because my article is not finished. When it’s written “article–something”, that is the article and the topic, it’s that the article is finished” (P6). The relationship between an organizational activity and the creative process appears particularly narrow: collection organization is not just a way to organize information resources in order to

carry out a task; it is also a way to organize the task by specifying the various steps that constitute it. This relationship seemed less narrow with students: while some of them occasionally relied on activity categories to organize their tasks, the majority of their collections consisted of categories related to the contents and characteristics of information resources (e.g. courses followed, different projects or work to be done). For students, the organization of information resources serves little to articulate or specify various tasks but rather helps navigate the information in order to find it later on.

Here again, time is important to understand how faculty members make sense of their information and think about how to organize their resources. They must gather information about projects that span several years, such as a three-year plan (P2), courses or research projects. Similarly, as their career progresses, some information becomes “cold” and requires archiving. P4 says, “I recognize them because it’s pretty fresh in my mind, but I’m sure that in three years, I will not have to go back there. It will remain there, as an archive [. . .] but when it was used actively, well, I knew them by heart. So, I find it easily at the moment.” In [Jacques \(2016\)](#), the situation was very different with students who had just entered a higher education institution and who, as their longest project, had to complete a year-long capstone project at the end of high school.

Finally, the interviews carried out with faculty members stress the importance of the social dimension of the tasks and roles of faculty members who collaborate and share information with various partners in their professional environment. Some information in their collections is perceived as potentially interesting for other people, for example, P2 explains that she keeps some interesting information for students and sends it to them. Some information is also structured and organized specifically for transmission. P4 explains, about a course: “I had to pass the torch to someone else. I reorganized [files] thinking that my hierarchy may work for me, but someone else may not be able to navigate it” (P4).

Informants also share different files with collaborators via the cloud. These shared collections seem complex to understand and require a multi-dimensional representation when explained by faculty members. Specifically, the goals and the nature of the collaborative activities are supported by the shared collection P3 explains that she shares a folder with a student: “I put it like that, because there were two articles she wanted us to write together [. . .]” (P3). P5 describes why he shared one of his folders: “This is a dissertation article, and while I wrote on my own, it’s from my dissertation, so I asked my supervisor. . . my supervisors. . . for feedback” (P5). Also important are the different people with whom this information is shared. P1 says: “this is a collaboration with my post-doc and other colleagues. This is with a research assistant. This one is just me { . . . }. This is with a student” (P1). Two further elements refer to authorship and control: the “owners” of the information or at least the creators or curators. (“{Student name}’s thesis is my folder” (P1). P2 says it’s important, in the shared folders, to “find my own production” (P2)) and who has control over this information or what is acceptable or not to do with respect to this shared information (P1 states: “Here, there is a lot of stuff that is out of my control, because they are shared files [. . .]” (P1)). Finally, the different actions carried out by the various people involved with this information and their associated collaborative tasks were mentioned. P4 explains, for example, about the collaborative writing process: “It’s a form of versioning in a way, to say, well, there is the original version, I commented I put {my initials}, someone else comments and adds {their initials}” (P4).

This list of dimensions is obviously not final but shows, amongst study participants, the importance of shared information management activities for faculty members, something less central to students’ practices. They were starting a high education degree, with little experience in maintaining shared folders. It was possible, however, to see information sharing practices via different channels without relying on cloud solutions. These different

analyses show the relevance of the apprehension activity to better grasp information organization practices. The limits of these practices will be discussed at the end of this paper.

Implementing relations. As noted above, implementing refers to leveraging affordances and cognitive artifacts to describe and structure information in ways that make it possible to interact with it. In Jacques (2016), student informants adopted different strategies for organizing information related to their studies. These ranged from simple strategies such as accumulating information with some attention given to file names. These simple tactics worked quite well for students confronted with a small amount of information to organize and information supporting one-off tasks spread over a short period. Other, more advanced strategies involved creating hierarchical structures using folders and subfolders. After entering university, the majority of students adopted such strategies that allow a subsequent return to resources by allowing them to browse their collections and thus “making sense” of a lot of information of a more varied nature and over a longer period of time.

All the faculty members interviewed for this research adopted the same type of strategies by filing documents related to their various activities and tasks in a hierarchical folder structure. These complex trees correspond to the ways in which they perceive their professional lives, their tasks and their roles. While some of the major categories are common to several of them (e.g. separating research from teaching), there is great diversity in the categories selected, their names, the depth and breadth of the structure, including the number of hierarchical levels. Once again, this demonstrates the personal and idiosyncratic nature of personal information organization practices. In relation to the process of apprehension, some folders and names refer to how individuals manage their activities. Personal information collections are also intentionally fragmented in hot and cold areas with some files serving as archives. Collections may also be voluntarily scattered across several devices for backup copies or because faculty members worked on different computers. It is interesting to note that while students used very few cloud systems to organize and store their information, most faculty members did. The main reason given was the ability to share information frequently with colleagues. The functionalities of cloud services are not always fully understood and raise questions about common folder management and the boundaries between personal and shared spaces. For example, P3 explains that she is confronted with folders created by others in the root directory that she does not feel comfortable moving. This is explained by a lack of understanding in how to articulate and leverage shared and personal spaces.

Cloud services are therefore used primarily as shared spaces where everyone can contribute directly while facilitating version control and backup copies. They are also used to synchronize different machines. P1 explains: “What links these three computers is Dropbox, so I have my Dropbox file, my Dropbox directory, that contain my most common files and also some backups” (P1). P2 uses the cloud in a similar fashion: “For me, it’s less to handle, to have Dropbox and I also ensure to have the same folders on each of the two computers” (P2).

The analysis confirms the relevance of the concept of implementation in building relations between documents in the collections by leveraging the affordances of information systems. Therefore, the implementation activity seems particularly appropriate to describe individuals’ personal information organization practices.

Metadiscourse about PIM

In addition to the analysis of the activities conducted to organize collections of personal information, it is also important to question the ability of informants to reflect on and describe their own organization practices. In Jacques and Fastrez (2014), students showed marked differences in their ability to describe in detail how they organized their information and justify their decisions. These dimensions, which are also found in faculty members are justifications based on interface and tool functionalities (P4 has “very little organization for

my emails because the search engine is quite effective”); justifications for information needs and supported activities and roles (P3 explains that she has created a folder for “co-authored book” and P4 explains that she collects articles for different events in which she participated); justifications related to a cost–benefit analysis of some practices (P6 explains in relation to how she names her records: “Before, I used to add a star, but I put numbers, it’s easier”) and justifications related to personal preferences (P4 explains that “the act of deleting for me is very difficult” or reflecting on certain classification choices: “It depends on my mood [. . .] so, I’m not consistent at this level, it’s a little scattered”).

Another type of justification appears to be more common and important among faculty members: certain organizational practices are described and rationalized with regard to the whole collection and the organizing “system” and are adopted to ensure system coherence and sustainability. P6 explains, for example: “all other documents did not fit into the other categories or I might need them right away. Minutes from the last departmental meeting, appendices with member responsibilities, a cost-effectiveness analysis of lecturer courses [. . .]” (P6). She also explains using cloud-based folders to make it easier to synchronize documents across devices. P3 also explains: “Some miscellaneous documents either are not exclusive to one course or are useful for all courses [. . .]” (P3).

This type of rationale reflects the capacity of some faculty members to adopt an analytical position with regard to their practices and collections. It is also found in their ability to introduce into their collections “meta” categories linked to the organization of information, such as “to classify” (P4). It is further reflected in the ability of some informants to consider alternative organizations or even the limits of their current organization. P4 explains “because, actually, I have several classification principles. This means that I sometimes take one, sometimes, the other, which leaves my system inconsistent” (P4). P2 justifies the reason for adding an “ = ” sign at the beginning of some folder names: “[. . .] I wanted them at the top of my list, I did not want to have to look at the bottom of my hierarchy, because I still have a good series of folders, so it’s just a strategy for me, to position them at the top. I could have numbered them. I could have grouped them into a summary folder called “research”, but I did not want to have too deep a structure” (P2).

Overall, most faculty member justifications are based on their activities and needs, whereas students were more likely to refer to personal preferences. This demonstrates the ability of faculty members to objectify their practices and align them more closely with their activities and needs. P1 insists on this need to be organized: “It is true that courses are among the most structured, otherwise you lose yourself and you lose your students. That is probably what requires the most organization for an academic” (P1). When asked to describe their practices, faculty members use a vocabulary specific to their field of expertise, notably in information studies. P4 uses concepts such as “classification plan”, “hierarchy” or “facet” to describe his collection: “I have several facets; sometimes, I classify by function, sometimes, I classify by event, sometimes by year” (P4). This does not mean that all the descriptions and justifications are as elaborated and worded in such a logical manner. There is a wide spectrum in the justifications given, even in individuals capable of detailed descriptions. For example, P3 explains, “This is the only case where I used the year. I do not really know why” (P3).

The relationship between the ability to self-reflect on one’s own practices in a multidimensional way using a rich vocabulary and the quality of activities remains a complex issue. Are individuals who are best able to self-reflect and describe their own practices and collections using finer conceptual distinctions the best at organizing their information? Caution should be exercised here even though our findings suggest, as was evidenced in the literature review on PIM, that the management and organization of personal information is intimately linked to the ability to adopt a “meta” positioning and taking a step back and the time needed to conceptualize outside of normal workflows and activities.

This ability can lead to organizational practices that are adapted to individuals' objectives. This also raises the question of the need to develop information science knowledge tailored to the needs of the general public, both in terms of methods and conceptual distinctions.

Discussion

Adapting the framework of information organization activities

Contrasting the analysis of faculty members and students practices confirms the relevance of distinguishing four fundamental activities to analyze the organization practices of personal information by individuals in a professional context. It allows for the use and refinement of the terms "Inclusion" and "Exclusion" rather than "Selection" and "Deletion". This four-activity distinction complements the mapping model, curation perspective model, personal information organization process and organizing system model. It focuses on the organization activity, one of the core PIM components, by breaking it down into different sub-categories of activities. It zeroes in on the specificities of the organizing process, as evidenced from the analysis of informants' interviews: the importance of the collection boundaries, an understanding of resource characteristics and relationships and their translation into structural relationships enabling interactions via various functionalities of digital tools. This research contributes an understanding of organization as an autonomous activity comprised of four complementary sub-activities. This particular focus isolates a subset of PIM activities and provides greater detail for a better understanding.

This research is compatible with the different theoretical frameworks presented previously. The organization activity, as defined by the authors, is a part of the "mapping-model" and is closely related to "keeping", in particular managing the boundaries of the collection (inclusion and exclusion) but also managing privacy and the flow of information. "Meta" activities are related to apprehension/implementation that require evaluating and making sense of information in order to organize it and ultimately, maintaining the collection over time. The conceptual definition adopted here is also compatible with the curation model and keeping management activities. Here again, inclusion/exclusion is closely linked to keeping activities, while apprehension/ implementation is closely linked to management activities.

Finally, the activities observed appear complementary to those proposed by Glushko. Inclusion/exclusion refers to selection activities, while apprehension/implementation is concerned with both the creation of organizational principles and their implementation in the collection in order to support future activities. However, maintenance does not appear as a separate activity but both as an objective and a consequence of previous activities: one maintains a collection over time.

Virtuality and actuality of PIM

By detailing the constituent activities of the organizing process, it was possible to highlight the differences and similarities between student practices and faculty member practices when organizing academic digital information. The practices observed are varied and strongly idiosyncratic, influenced by many factors, a prevalent find in PIM studies (Bergman and Whittaker, 2016; Gwizdka and Chignell, 2007). The different characteristics of projects/objectives/roles to which resources are associated partly explain these differences. In particular, the social and collaborative nature of projects was marked more heavily with faculty members. This influenced the hierarchical structures produced not only for the individual but also for every other partner with whom these collections are shared. These supported projects and roles appear to be more complex, requiring careful planning division, which also explains a growing reliance for faculty members on tasks management categories

(Whitham and Cruickshank, 2017; Gwizdka and Chignell, 2007) in their personal information spaces.

At the intersection of individuals' characteristics and their projects is another crucial dimension to the understanding of differences between students and faculty members: the temporal dimension. PIM activities are intrinsically timely as they allow for the possibility to retrieve information over time: "(. . .) much knowledge work involves integrating and re-using information that has previously been created or accessed" (Dumais *et al.*, 2003, p. 72). The difficulty to re-find information is related to the time period passed between the original access and the re-finding (Elsweiler *et al.*, 2011). When organizing personal information, individuals have to anticipate future needs (Bruce, 2005) as well as to do some "Maintenance" to preserve their collections over time. Bergman and Whittaker (2016) thus speak of PIM as a communication with someone's future self, akin to Dervin's sense-making (Dervin *et al.*, 2003).

This anticipation process appears to be characterized by uncertainty: some anticipated needs will never prove relevant, and conversely, some unanticipated needs may emerge. In this sense, one of the central dimensions of PIM practices is the question of virtuality as defined by Lévy: "(. . .) the virtual is a kind of problematic complex, the knot of tendencies or forces that accompanies a situation, event, object, or entity, and which invokes a process of resolution: actualization. This problematic complex belongs to the entity in question and even constitutes one of its primary dimensions" (1998, p. 24–25). The virtual and the real are not in opposition with the nonexistent on one side and the existent on the other. On the contrary, the virtual is in dialog with the actual: two different modes of being.

The distinction between real and virtual makes it possible to shed light on PIM practices on two levels of temporality. The first links the time the organization takes place with a future return to the collection. Indeed, when organizing a collection, an individual must resort on some sort of virtualization: a consideration of the relation between the collection and future needs in order to ensure the success of this future retrieval. This virtualization effort may be more or less strong: recording a resource that will be used within minutes mobilizes less virtualization efforts that organizing resources for use years later. This virtualization effort is evidenced in collections through the various activities detailed in this article.

The second level of temporality to consider using the real/virtual distinction is the relation between the time of use, the time of retrieval and the time prior to the organization. When searching and interacting with a collection, an individual does so at a given point in time based on what is possible from the collection and relying on current browsing techniques to meet current needs. This actualization is characterized by searching for a solution in the problematic and virtual environment that is the collection. This effort is variable: retrieving information recorded minutes ago is not very intensive, and human memory is fully capable to supporting this process. Conversely, returning to a complex collection of resources recorded years ago requires considerable effort in browsing this complex environment and relies on a mix of memories and traces left in the structure of the collection.

Indeed, individuals do not have a perfect knowledge of their collections, which is merely the external manifestation of an internal conceptualization: a collection offers various navigation and search possibilities, with the ability of rediscovering information. This is a major difference between students and faculty members: the age of their digital practices and collections. Indeed, our student informants were beginners with their digital uses: first personal devices, first truly digital personal collections and resources a few years old at most. On the other hand, faculty members often had many years of experience, with some being close to retirement. The difference in collection complexity is influenced by both the quantity and diversity of the information therein as well as the quantity and diversity of projects/roles this information supports. It is also directly influenced by the age of the information. This complexity is involved in creating a gap between the state of the collection and the mental image one has of the collection. For example, a larger collection or older information is more

“virtual” and represents a more complex problem with multiple dimensions and potentialities. It also involves greater efforts of actualization to retrieve the right information or older information than for something more recent or active in one’s memory.

Future research

This work, focused on organization as a core PIM activity, contributes to the analysis of these practices which remain crucial for individuals who must make sense, over time, of a mass of complex information. Our update of the four constituent activities of information organization makes it possible to understand the abstract concept of information organization with this new operational definition. This is possible by analyzing individuals’ usual practices and by taking into account their points of view.

This distinction could be of interest to PIM developers, who could incorporate such specific features to help individuals organize their information. This redefinition also contributes to a better understanding of PIM activities, which could lead to educational initiatives aiming at fostering PIM literacy in order to help individuals better manage their personal information to best support their projects.

From this analysis, several areas of future research appear relevant. First, the link between the ability of individuals to analyze their own practices and the quality of these practices should be investigated. For training purposes, it might be interesting to see how knowledge transfer from information professionals, using specialized concepts and terminology, to the general public could lead to an improvement on individual’s practices thanks to increased self-reflection. Then, the proposed concepts of virtualization and actualization serve only as a basis from which we can continue to understand the relationships between temporality, memory and collections in a PIM context. Finally, the question of the articulation between personal and shared spaces often remains problematic for many users, and both designers and educators should work to streamline interactions around shared collections.

Limitations

Several limitations to this research must be kept in mind. The relatively small number of interviews conducted with faculty members conducted for this study as well as the analysis of the practices of two groups of informants with different objectives, experiences and contexts requires great care about possible comparisons as well as generalization of these results. This exploratory research contributes a focused characterization and explanation of practices rather than an examination of individuals, and the findings should not be seen as representative of all students or faculty members. Nevertheless, the proposed distinctions and trends analyzed are sufficiently suggestive to be integrated to the broader PIM literature and be worthy of discussion.

If one of the strengths of this research is the high level, general nature of the analysis, by providing a global portrait of organization practices independent from local variations (e.g. types and number of information sorted, tools used, projects accomplished), this approach forgoes part of the richness and complexity of practices in the field. For example, if the relationship implementation activity seems relevant to understanding, on some level, how individuals grasp the affordances of the digital tools they use, finer analyses should be done on the different components of this activity: what are the names given to the files, the structures created, the spatial arrangements created, etc. Different approaches and data collection tools are required to analyze both the strategies implemented and the organization that are produced out of it. Nevertheless, this high-level approach also has the benefit of intelligibility, by making it possible to define competencies using meaningful categories for educators interested in the organization of personal information and PIM literacy.

Conclusion

Contrasting students' and faculty members' PIM practices allowed for a refinement of certain information organization activities proposed by Jacques (2016). Specifically, the concepts of "Inclusion" and "Exclusion", instead of "Selection" and "Deletion", make it possible to account for a greater diversity of actions to organize information while maintaining a clear delimitation of organizational activities at the onset and outset of the collection.

This paper also contributes to a better understanding of faculty members' PIM practices by documenting their information organization activities and the contextual factors (e.g. social relations, institutional constraints, goals, etc.) in which they emerged. Finally, it has identified several dimensions, including the centrality of time and the relevance of the distinction between virtualization and actualization processes to understand PIM practices. Furthering our understanding of these practices contributes to the improvement of theories underpinning such analyses, to the development of tools that support them and to the implementation of PIM literacy initiatives to help people better organize information in their daily lives.

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