informationresearch

VOL. 19 NO. 1, MARCH, 2014

Continuum thinking and the contexts of personal information management

Isto Huvila, Jon Eriksen, Eva-Maria Häusner and Ina-Maria Jansson
Department of ALM, Uppsala University, Thunbergsvägen 3H, SE-75126 Uppsala, Sweden

Abstract

Introduction. Recent personal information management literature has underlined the significance of the contextuality of personal information and its use. The present article discusses the applicability of the records continuum model and its generalisation, continuum thinking, as a theoretical framework for explicating the overlap and evolution of the diverse contexts of personal information and their implications for personal information management practices.
Method. This article is based on three empirical case studies on 1) the personal information management practices of sound artists (qualitative semi-structured interviews), 2) graduate students' management of scholarly articles (web survey of Swedish students) and 3) the management of personal archives at Swedish archival institutions (qualitative semi-structured interviews).
Analysis. The empirical material was analysed using the constant comparative method (case 1), non-parametric statistical tests including Friedman's test, Kruskal-Wallis analysis, Wilcoxon-Signed Rank test, Mann-Whitney-U test and Chi-square test in SPSS version 20.0 (case 2), and thematic analysis (case 3).
Results. The continuum approach and the conceptualisation of diverse contextual aspects of personal information management as axes on a Giddensian spatio-temporal continuum can help to understand the contextual changes and continuities of personal information management and use.
Conclusions. The records continuum model provides a useful theoretical basis for explicating personal information management as a process of Giddensian time-space structuration similarly to how Upward argued that the theory is useful in the context of explicating the record-keeping process and, in more general terms, providing a framework for theorising particular types of document-centric management processes.

Introduction

The interest in personal information management research has grown steadily during the last three decades. During the last few years authors such as Whittaker have broadened the focus of research from software specific issues, and practical management and retrieval of information, to personal information curation. At the same time, the related line of research on personal knowledge management has underlined the relevance of studying the implications of personal information in organizational contexts (Gorman and Pauleen, 2011). Even if researchers like Whittaker (2011), Barreau *et al*. (2009), and Elsweiler (2009) have put more emphasis on the aspect of use of personal information, Fourie's

critique of the earlier research on the lack of a holistic view of '*the issues end-users need to consider to gain more in terms of quality, productivity and creativity when using information* (Fourie, 2011, p. 388) is still highly relevant. The focus of the research has been on the methods of capturing and managing personal information instead of trying to understand these practices as a part of the totality of the information activities of individuals. Fourie's main suggestions to remedy the situation are to put more emphasis on embedding personal information management in the context of information behaviour and information practices, considering the multiplicity of its objectives, and to see it as contextual to the broad landscape of information and information infrastructures. In the earlier research, personal information management has been treated as a relatively acontextual phenomenon and, similarly to information behaviour research (Davenport, 2010), studies have been suffering from the lack of a solid theory (or solid theories) of personal information practices (or behaviour). At the same time, research has had a tendency to focus on practices in spatially, socially, and temporally isolated contexts, for instance, in individual workplaces over a relatively short period of time (Jones and Teevan, 2007, p. 76-77).

The aim of the present study is to explicate the interplay of the contextual continuities of personal information management in the light of continuum thinking based on the record continuum model, a theoretical model formulated by Australian archival theorists from 1980s onwards. The specific focus of this article is to understand how various contextual aspects, conceptualised as axes, of personal information management influence the practices of capturing, organizing, and pluralising i.e. using personal information for diverse purposes. The study is based on two assumptions. Firstly, we posit that all personal information management activities are contextual, and the role and contexts of particular pieces of personal information change in time. Secondly, we argue that a central premise of explicit and implicit personal information management is to provide opportunities to remember, and even more so to (re-)generate, relevant information in order to help us to act in a manner that makes sense to us, and to forget and place less emphasis on things we consider as less significant. The study draws on the findings of three empirical studies on the management practices of scholarly information, the personal information management practices of sound artists, and the convergence of personal information management and personal archives.

Literature review

Personal information management

Personal information management research focuses on how individuals collect, organize, store, retrieve, and use information in their personal domain (Boardman and Sasse, 2004). The term was coined in the 1980s and, even if it was preceded by earlier research on office work (e.g., Malone, 1983), it was not until the late 1990s that it began to expand as a specific branch of research in the information science field. A large part of the earlier research has focused on tools and organization of personal collections, as well as the processes of saving, organizing, and retrieving of information (Whittaker, 2011), and the cognitive processes that influence how people engage in these activities (Jones, 2007).

Jones (2007) conceptualises personal information activities as related to (re)finding, keeping and meta-level activities including managing, maintaining and organizing information. A central aspect of personal information management is the management of the personal space of information, or in terms of Bruce *et al*. (2004), personal information collections that consist of personally available, both captured and otherwise, at least nominally controlled and accessible information (Jones, 2007). The focus of Jones is, as Whittaker (2011) remarks, on the use and management of (originally) public information. Whittaker (2011) himself assumes a slightly different point of view by putting more emphasis on the curation and exploitation of personal information collections. Also Fourie (2011) emphasises the significance of the exploitation dimension by suggesting that tools should be integrated more closely with, for instance, mind-mapping tools to support making creative and conceptual links between different types of documents. The aspect of exploitation of personal information has also been discussed in the context of personal knowledge management research. Personal knowledge management claims to put emphasis on its ability '*to allow the individual to better manage their knowledge processes and interaction, collaboration and knowledge exchanges with others*' with a '*goal of supporting individual knowledge workers rather than establishing an organizational approach*' (Razmerita *et al*., 2009, p. 1022). In spite of its outspoken emphasis on individuals, the logic of personal knowledge management research is based on '*supporting knowledge workers*' (in their work) and helping them to achieve (essentially) collective goals (Razmerita *et al*., 2009, p. 1022). As Jones and Teevan (2007, p. 18) note, a major challenge of personal knowledge management is to articulate useful means to manage the transformation of non-inscribed knowledge to inscribed information and back.

Chatti (2012) has recently suggested a slightly new approach, personal knowledge networks as a substitute for more traditional models of personal knowledge management. He argues that the traditional models of processual (basically the socialisation, externalisation, combination, internalisation (SECI) model of Nonaka and Takeuchi, and related approaches) and objectifying ('*knowledge-as-a-thing*') knowledge management, and consequently that personal knowledgement management models, are not useful in describing the complexities of the contemporary landscape of personal knowledge. Chatti is undoubtedly correct in his urge for the need for complementary models of personal knowledge management, and in that the personal knowledge network approach provides a functioning framework for articulating the complexity and fast-paced change in the environments of personal knowledge, from the perspective of an individual and her network. The model does not, however, diminish the significance of other models with complementary perspectives. For instance, even if the personal knowledge network model claims to bring together organizational and individual perspectives, its focus is on individual actors (nodes) and their interplay instead of the dynamics of the knowledge network in a broader social context. Similarly, even if the model accounts for change, its primary focus is the change within and at the peripheries of the network instead of the change in the context of the entire network.

Earlier research has identified several challenges in the management of personal information. The keeping of information using several parallel systems leads to information fragmentation. Different versions of files are kept on different computer storage media and as printed documents. Similarly, information on a particular topic can be found in files, e-mail messages and bookmarks (Henderson, 2011; Bergman *et al.*, 2006). After the earlier focus on the organization of information, the apparent complexity and contextuality of effective information organization, together with a rapid development of search technologies, has lead to an increasing interest in search as a method of personal information management (Elsweiler *et al.*, 2011).

Diekema (2011) criticises the gap between descriptive and prescriptive personal information management studies. Even if researchers have been active in empirical research on actual behaviour and in developing systems and approaches to support the practices of personal information management, the two lines of research converge only a little. Researchers have delved into the details of personal information management (Jones and Teevan, 2007) and personal archiving (McKemmish, 1996) behaviour and practices of individuals in a number of studies, but the influence of these findings is difficult to discern in the prescriptive research.

One apparent reason for the lack of convergence of the two lines of research is the dual, simultaneously explicit and implicit, function of personal information management, which is partly about practical organization of information resources, but as Malone (1983) remarked, the practical information organization strategies serve also a memory function. The activity of managing information is equally important as a reminder and a source of information as a usefully organized collection. The significance of memory and reminding as a central outcome of effective personal information management (as in the context of life-long management of personal information collections, e.g., Marshall, 2007) and a constituent part of the process itself has been underlined in the later research, for instance, by Barreau (2006). According to Elsweiler *et al.* (2009) memory is a focal aspect of the management of personal information. Elsweiler *et al.* (2006: 51) suggest accordingly that tools should be designed to provide '*better support for the characteristics of human memory*'. Both this particular observation and the general emphasis of research, of the significance of reminding, refer to a perception of memory as a systemic notion, not merely as a collection of things to remember. This idea of memory resembles the conceptualisation of memory of Bowker and Chou (2009). They suggest that a learning machine (e.g., an individual) does not need memory if it is capable of deriving required information from its environment. In terms of their proposal, personal information management may be seen not only as a process of managing things to remember and to remind us, but also as a process of maintaining and developing the capability of deriving required information from the environment.

Earlier research suggests that the success of the process is dependent on the technical characteristics of tools, personal and social factors (Jones, 2008), but also on affective ties and engagement. Elsweiler *et al.* (2011) have shown that refinding e-mail messages is easier when the individual remembers when the message was received and who else received it. Jones (2008) has made related remarks on the points of convergence of and flow theory of Csikszentmihalyi (1990), suggesting that the state of flow makes information easier to remember. The significance of affects is also briefly discussed by Robinson and Johnson (2012) in their study of students engaged in the creation of coursework.

The continuum of personal information

Besides personal and immediate implications, personal information management also has social and temporal dimensions. Personal knowledge space situates the social memory function of managing personal information in an

organizational context (Razmerita *et al*., 2009). Apart from immediate and short to mid-term personal benefits, an effective management of personal information (or in knowledge management terms, knowledge) is anticipated to have positive implications for (public and private) organizations. In contrast to the focus of personal knowledge space on immediate contemporary benefits (criticised by e.g., Chatti 2012), personal archiving related literature emphasises the long term nature of personal information collections (Marshall, 2008a; Marshall, 2008b). Jones and Teevan (2007, p. 57) identify some long-term related issues. The central complication of long-term personal information management is that the value and significance of personal information changes over time. For instance, concert tickets are first used as tokens for entry at a particular event but they might have value later as memorabilia. Most acknowledge that old e-mails and especially photos are likely to have some value in the future, but still lack the interest to invest time and effort to manage them at the present. The fundamental problems relate to the conflicting interests of access and long-term maintenance, the difficulty of predicting the future value of individual information objects, the management of distributed storage of personal information, preserving the original context of the materials, managing the technical issues of format obsolescence, and the lack of incentives to put a necessary curatorial effort into the long-term preservation of personal information (Jones and Teevan, 2007, p. 62-65). Even if people know that some concert tickets could be of value in the future, it is difficult to say which ones will be the most valuable or dearest ones in ten or twenty years. In this respect, the keeping of only tentatively interesting small pieces of paper safe over the years can be extremely unrewarding when individuals are coping with more urgent issues in their daily lives.

The long term nature of the evolution of documents and their contexts has been addressed by the records continuum theory. The theory has its roots in Australia and was comprehensively documented by Upward (1996; 1997) and his colleagues in the mid-1990s. Upward later developed related additional models for information continuum (together with Barbara Reed and Don Schauder), information systems continuum and publishing continuum. The records continuum model and the other similar continuum models are based on Giddens theory of structuration and its view that societies are shaped by individuals and their memory traces. In contrast to document and record centric theorising (and similarly to, e.g., practice, in Talja, 2010, and documentation related theories, in Lund, 2009), the starting point of the records continuum model is in human activity (Cook, 1997). Unlike life-cycle theories, the continuum theory emphasises the persistent change of archival records and their contexts.

The records continuum model is based on four dimensions of recordkeeping process: 1) create, 2) capture, 3) organize, and 4) pluralise, that correspond with the four regions of Giddensian structuration theory of time-space distantiation. According to Upward, create corresponds with intersections of regions and a spatial spread away from the immediate contexts of interaction, capture with routinisation, organization with time-space distantiation, and pluralisation with the forms of societal totality (Upward, 2005). According to the theory and the model, the dimensions describe how a record is moved (or distanced) from its original context of use to become a part of a collective memory. When placed in a public archive, a personal letter to a public authority changes from being evidence of a single personal transaction to become a part of the bigger picture of how people in general interacted with public authorities in a particular period of time.

The aspects of the contextuality of records are represented by four axes of evidentiality, transactionality, record-keeping containers, and identity. The aim of the model is to provide a framework for conceptualising recordkeeping and archiving as processes that '*fix documents which are created in the context of social and organizational activity, i.e. human interaction of all kinds, and preserve them as evidence of that activity by disembedding them from their immediate context of creation, and providing them with ever broadening layers of contextual metadata*' (McKemmish, 2001). According to the model, a record created by a person as a part of an individual transaction can become evidence of broader societal trends. For instance, a receipt for purchasing a chocolate bar today can be used in the future as evidence of general consumption patterns at the turn of the millennium. Different dimensions of recordkeeping process (create, capture, organize and pluralise) emphasise different contextual layers of the identity of record creators (from individual actors to institutions), level of abstraction of records containers (from individual documents to archival collections), and the levels of evidentiality (from individual events to the collective memory) and transactionality (from acts to their purposes) of the records. Records are seen in the context of the model as a specific '*genre of documents in terms of their intent and functionality*' (McKemmish, 2001, p. 335). Records are evidentiary, contextual, and transactional in contrast to being informational or topical (McKemmish, 2001). McKemmish (2001) describes the model and how it conceptualises record-keeping and archiving processes to:

- create [archive] documents-as-trace of the act in which they participate;
- capture records-as-evidence by linking documents-as-trace to the transactions, acts, decisions or communications they document, related records, and their immediate business or social context;

- organize records-as-evidence by *placing* them in the context of the corporate or individual archive, and managing them in frameworks that enable them to function as individual, group, or corporate memory; and
- pluralise records-as-individual/group/corporate memory by *placing* them into an all-encompassing framework that enables them to function as accessible collective memory. (McKemmish, 2001, p. 352)

In practice, the create dimension relates to the event when a concert ticket is printed as a record of the right of entry to a particular concert, and when it is stamped upon entry to the concert hall as a record of actual participation. The capture dimension relates to the event when the ticket is kept (as a record of the participation), perhaps put aside to be included in the personal collection of memorabilia and not directly discarded after the concert. organization refers to the following event of saving the ticket as a part of a personal or a larger family or community archive together with other documents. The fourth dimension, pluralise, relates to the phase when the archive is opened up for other uses, and for instance, when a researcher is granted access to consult the archive for a research project on typical pastimes in the area.

There are some apparent similarities between how record-keeping processes are conceptualised in the records continuum model and how information management processes are described in the literature. The records continuum model does, however, go one step further to address the continuum of individual processes. Therefore we suggest that the records continuum model and a somewhat more generic continuum thinking can function as a basis for a better understanding of the complexities of personal information management. In contrast to the original records continuum model, a personal information management aware continuum model needs to address the plurality of the nature of documents (cf. records) and their use (i.e., beyond evidentiality). Whereas records continuum focuses on a specific genre of documents, personal information management is essentially concerned with documents as evidential, transactional and contextual, but also informational and topical artefacts. In the records continuum model, the four axes represent the broadening context of the evidentiality and transactionality of records, recordkeeping containers and identity of the authorities of their origin. A broader continuum model for personal information would need to implement additional axes for capturing any additional contexts of relevance specific to the personal information. In the context of personal information management, a concert ticket is not merely a piece of evidence of the participation in a concert, but it can also be a reminder that the owner of the ticket proposed to his future wife in that particular concert; it might state the names of the artists who performed in the concert and help the owner to remember what happened before and after the event.

Upward (2000) assumed a similar approach of identifying new axes of structuration in his work on the related continuum models: information continuum and the somewhat more speculative information systems continuum and publishing continuum models. The information continuum model of Upward, Reed and Schauder (in Upward, 2000) adds axes for action/structure, technology, storage/memory, and categorisation; the information systems continuum model adds axes of power modalities (inspired by the writings of Giddens and Foucault), data storage, data modelling, and data plumbing (i.e. connectivity of records within and between organizations). The publication continuum model adds dimensions of learning, issuance (publishing authority), publication containers, and reach. Even if the additional axes proposed by Upward and his colleagues in the derivative continuum models are of potential relevance for research, they are explicitly presented as sociological (in the case of the information continuum model) and top-down views to information management, information systems development, and publishing. Their point of view is on how society is created and reconstituted by certain types of records and individual actions, not (as in personal information management) how arbitrary information and individual actions create and reconstitute the society.

A continuum model sees the emergence of, for instance, records or information as a series of contextually anchored parallel processes of structuration with multiple simultaneous axes of relevance. In the process of archiving and/or managing records and information they turn from being only personally and situationally relevant to have broader implications as a part of the collective memory. According to the model, it is irrelevant to make a distinction between current and future uses of records (or information), or to conceptualise their processes of emergence and existence as a linear life-cycle with only a single beginning and end. Similarly, the model is based on an assumption that records (or information) serve simultaneously multiple purposes in multiple contexts. A personal record is not merely a personal record, but can serve at the same time diverse social and personal informational, memory and evidence functions. Dever *et al*. (2011) illustrate these shifts in the temporal contextualities and uses of personal archives in their study of three Australian writers.

Besides time, another aspect of the continuum addressed in the earlier literature is the interplay of personal and social contexts. Their convergence and divergence is also relevant in the context of managing personal information. As Harris (2001) notes (and as McKemmish (1996) suggested), the boundary between personal and corporate record keeping is unclear. It is '*shifting and soft*' in both shorter and longer temporal and cultural perspectives. In addition, as Upward and McKemmish (2001) underline, the transcendence of boundaries applies to the dimensions of archiving (and in the

context of personal information management, management) and those of collective archives, knowledge and memory. The latter dimension highlights the fluctuations of the "culture of information" (Liu, 2010) as a significant factor that affects the uses of personal information on the continuum. Cook (1997) had observed already, in the late 1990s, that archiving had changed from being a public service to become a service provided by members of the public. It has become increasingly common that individuals themselves are supposed to preserve both self-created information, and information and official documents about themselves, for later use. At the same time, the political and economic exploitation of information about individuals has increased (Gandy, 2011; Werbin, 2012).

In summary, we posit that the records continuum model and a broader continuum thinking can be helpful in shedding light on the complexities of managing and using personal information. Continuum thinking provides a framework for explicating the continuum of the overlap of the diverse contexts of relevance of personal information, the implications of this overlap on how information is managed and used, and how the management and use influence the relevance of the information in time. In the following sections, we will discuss our three case studies and how they elucidate different aspects of continuum thinking and the records continuum model in the context of personal information management, and highlight the implications of the decisions made during the creation, capturing, organization, and pluralisation of personal information.

Methods and materials

This article is based on the findings of three empirical case studies of personal information management and archiving. The results of the studies are used to highlight different dimensions of personal information practices in the context of the continuum model and to discuss the issue of the contextuality of personal information management. Because of the case study based approach, we are concerned with identifying, mapping, and understanding significant issues rather than attempting to document an entirety of relevant issues. Jones and Teevan (2007, p. 76-77) have noted that a large part of related research has been based on empirical studies and prototype investigation. The limitations of the studies, as they perceive them, are that research has been limited to individual contexts, individual tools and the temporal coverage of the studies has been short. In contrast, there has been little research looking at multiple tools and contexts, and longer periods of time. The aim of the multi-method and multi-context approach of this study is to address these shortcomings by looking into several phases and contexts of personal information management and personal information use. Instead of attempting to provide a concise view of an individual process, the present methods help to highlight pertinent issues of the contextuality of personal information management by looking at diverse contexts. We acknowledge that in the future, it is necessary to look closer at the various findings of the present study in specific contexts.

Case study 1: Artists' use of personal collections

The first case study (C1) analysed how artists organize and use their personal collection from a personal information management perspective, and how that use affects their practice and their art production. A secondary objective for the case study was to articulate the ways that personal information collections are used as tools for the creative user. The empirical data consisted of five qualitative semi-structured interviews with Swedish and Norwegian sound artists complemented with commented walk-throughs of their personal information collections. The material was analysed using the constant comparative method (Glaser and Strauss, 1967). A second researcher reviewed the results in order to evaluate and confirm the validity of the observations.

Case study 2: Personal management of scholarly articles

The second case study (C2) was about management practices of scholarly information. The purpose of the study was to investigate, from a personal information management perspective, how and to what extent graduate students manage the scholarly literature they need for their course and thesis work. The study was based on an analysis of how individuals kept and managed electronic scholarly articles. The basic data was made up of 316 complete answers of Swedish graduate students and was gathered using a Web-based questionnaire survey. The respondents were asked to rate the frequency of their different types of information administration behaviour on a seven level Likert-type-scale. Subsequently, items concerning specific information administration behaviour were posed, followed by questions on the respondent's sociodemographic status. The questions were based on previous research (Hemminger and Niu, 2012; Jones *et al*., 2002; Liu, 2006; Tenopir and King, 2002; Tenopir *et al*., 2005; Tenopir *et al*., 2009) and the questionnaire was tested in a pilot study (n=15), then modified according to the findings and comments of the respondents. After the collection of the answers the quantitative data was analysed using non-parametric tests including the Friedman's test, Kruskal-Wallis analysis, Wilcoxon-Signed Rank test, Mann-Whitney-U test and Chi-square test in SPSS version 20.0.

Two open-ended questions, '*Do you manage scholarly articles by any other means not mentioned in the questionnaire?*' and '*Why do you think you manage scholarly articles the way you do?*', were analysed using qualitative content analysis.

Case study 3: Personal information management and personal digital archiving

The third case study (C3) investigated personal information management in the context of personal digital archiving. Personal archives and collections of, for example, letters, photographs and manuscripts are a result of personal information management activity. The rapid emergence of personal digital information technologies has radically changed the premises and practices of managing and archiving personal information. These changes have implications for practices on both the individual (i.e. individuals with their own personal collections) and institutional (i.e. archival institutions preserving personal archives) level. The study was based on qualitative interviews with five librarians/archivists in four major Swedish university libraries/archives, all with extensive collections of personal archives, and a survey of Swedish born-digital personal archives (i.e. archives consisting of only digital personal materials e.g., computer files and documents, digital images or databases with no printed/non-digital originals) held at major archival institutions. The interview material was analysed using thematic analysis (Braun and Clarke, 2006) by one researcher and the results were reviewed independently by another researcher.

The study looked into the existing technical tools and solutions for personal digital archiving today and how these solutions work (or do not work) from the perspective of archival institutions. Secondly, the study investigated the attitudes of librarians and archivists on digital personal archiving, how personal information collections are handled at archival institutions today and how the professionals perceive the future. Finally, the study asked the informants about their views of possible best practices of collecting and curating for personal digital information at archival institutions.

Case 1

The first case study looked into the personal information collections of five sound artists (dubbed Anders, Lars, Johan, Annika and Linda). A computer was the principal tool used by all informants. All informants also had, as expected, large collections of sound, text and images, both in digital (including internal and external hard discs, DVDs) and analog (e.g., books, tape records, vinyl records and VHS-cassettes) forms, even if they had difficulties in the beginning of the interviews recognising their collections as personal information collections. The personal collections were a mix of private and work related materials, collected, edited, and self-created data, as well as administrative material relating to exhibitions and grant applications.

Within their personal information collections, all informants had collections that were difficult to access mainly because of their technical form. For instance, Anders and Lars were convinced that they were unlikely to use their large collections of sound stored on MiniDiscs because of the difficulty of accessing them.

The informants had two different approaches to collecting. Johan and Linda collected materials for specific productions while Lars and Anders tended to collect materials on a more intuitive and prospective basis for a possible future use. For them, collecting was an important part of the creative process. Anders explains that:

> I collect things all the time, [things] I know I am interested in, but it is not directly obvious what I am interested in... So, it can begin [with collecting interesting things], but when I use it, it depends on [the fact] that I have begun to get interested in a specific topic... the topic becomes a magnet that pulls different types of materials towards it... It is about drawing a line between points and to make a whole out of it, of different small parts. It is actually about contextualising the material. (Anders)

Even if Lars had a similar approach to collecting interesting things, he turned to be more goal-oriented in his collecting when the project became more clearly defined.

Annika, on the other hand, seldom collected materials and relied mainly on materials she created herself. Anders, Lars and Linda saved practically everything they collected/captured, whereas, especially with Web information, Johan had begun to rely more on searching it anew rather than storing it.

Strategies of managing personal information also differed between the individuals. Annika and Lars used larger folders whereas Anders, Johan and Linda used more meticulous methods for sorting files.

> Here's my own system I have developed over many years, and I can quickly find and remember [things] even if there is no information on week, date or name on everything" (Johan).

Because of the looser structure of the organization of information, Annika and Lars relied more on the built-in search function of the operating system than their three colleagues. Of the three sorters, Johan was most inclined to delete files, whereas Anders and Linda kept most of the information they had collected.

In addition to the personal strategies, the ways that the artists named and filed their documents changed if they anticipated that the documents would be reviewed or used by others. Linda and Johan in particular had assumed parallel, more detailed strategies for managing and naming information they used in collaborative work. Linda, who often works in close collaboration with a partner, had with her partner developed a naming system where all their shared documents were labeled with title, version, author's initial, and sometimes a short description of the edit made. Johan is more careful when naming files for collaborations as well; he often has to send whole project folders to the person he is working with, and descriptive naming of the individual files provides a better overview and helps keep things clear.

Uses of personal collections also varied between the informants, but in general the collections served more often the purpose of a source of inspiration and a collection of ideas rather than a resource of reusable goods. It seemed that, as taking notes can serve as an extension of the memory, a collection can function as an external vehicle for the process of thought, and that the collected materials and the way that they are organized help not only to remember or retrieve certain things but also fosters connections between these materials. The collection in this sense becomes an aggregate of documents as mental notes, which over time becomes an instrument for developing ideas. It simultaneously serves as a memory tool for keeping ideas at hand and as a resource for serendipitous browsing.

The study concluded that artists' personal collections, while diverse in content and structure, serve many shared functions in creative processes, and that the use of personal collections as tools highlights needs that could be better met by the tools used.

Case 2

The case study investigated how graduate students manage electronic scholarly articles. The findings showed that scholarly articles are captured and organized in different ways in different subject disciplines (Table 1), male and female students (Table 2) manage their articles in different ways, individuals tend to use multiple approaches for the management of their articles and the management practices correlate with reading practices.

Table 1: Mean values, standard deviations (within parentheses) and K-values (Kruskal-Wallis) for each subject discipline, types of article and reference management process.

Reference management process		Humanities and theology	Law & social science	Science	Technology	Medicine and odontology	Nursing and care	Arts	K-value
Save the article		5.43 (1.30)	5.14 (1.42)	5.81 (1.58)	4.57 (2.06)	4.37 (1.80)	6.31 (0.89)	5.33 (1.51)	48.28**
	Save a printed copy of the article	3.67 (1.69)	3.05 (1.65)	3.77 (1.62)	2.79 (2.01)	3.27 (1.79)	5.55 (1.53)	3.50 (2.26)	37.46**
	Save a digital copy of the article	5.27 (1.64)	5.32 (1.70)	5.62 (1.60)	4.79 (1.93)	4.47 (1.88)	4.03 (2.03)	5.83 (1.17)	24.68**
	Attach the article to an e-mail	2.87 (1.74)	3.82 (1.62)	3.69 (1.82)	3.21 (1.53)	3.02 (1.84)	3.07 (1.83)	3.83 (1.83)	10.21
	Upload the article on a cloud platform (e.g., Dropbox)	2.30 (2.20)	2.36 (2.01)	2.56 (1.93)	3.07 (2.23)	2.26 (1.76)	1.38 (0.86)	2.17 (1.33)	10.72
		5.00 (1.91)			4.79 (1.67)	4.06 (1.94)			20.26**

		Save a copy on your computer's hard disc		4.82 (1.82)	5.06 (1.70)			3.62 (1.97)	4.83 (1.60)	
		Save a copy on a portable storage device	3.13 (1.46)	3.09 (1.72)	3.04 (1.49)	2.93 (1.69)	2.51 (1.65)	2.66 (1.78)	3.67 (1.63)	11.63
		Copy parts of the article and paste them in a new document	2.27 (1.28)	3.23 (1.38)	2.31 (1.46)	2.50 (1.34)	2.07 (1.37)	1.76 (1.09)	3.33 (1.75)	20.03**
Save the reference			4.93 (1.34)	4.50 (1.68)	5.62 (1.65)	4.00 (1.75)	4.88 (1.92)	4.38 (2.06)	4.33 (1.21)	17.24**
	Save the reference digitally		4.40 (1.75)	3.86 (1.96)	5.60 (1.60)	4.00 (1.96)	4.69 (2.09)	3.21 (1.99)	4.50 (1.38)	31.17**
		Save the url-link in an e-mail and send it to yourself	2.47 (1.53)	3.14 (1.64)	2.96 (1.66)	2.86 (1.61)	2.42 (1.81)	2.17 (1.47)	3.50 (1.76)	11.71
		Save the reference and send it to yourself	2.50 (1.59)	3.32 (1.73)	2.85 (1.53)	2.51 (1.34)	2.50 (1.79)	2.55 (1.50)	3.17 (1.72)	8.48
		Save the reference in a bibliographic management system	1.00 (0.00)	1.82 (1.62)	3.37 (2.47)	1.64 (1.50)	2.23 (2.09)	1.14 (0.44)	1.50 (1.22)	40.92**
		Save the reference in a file on your computer	4.20 (1.61)	3.45 (1.79)	3.37 (1.91)	3.57 (1.74)	3.14 (1.91)	2.38 (1.45)	2.83 (1.72)	15.19*
		Save url-link in a file on your computer	2.87 (2.03)	2.45 (1.50)	2.50 (1.70)	2.21 (1.31)	2.12 (1.63)	1.76 (1.15)	3.33 (1.75)	10.51
		Save the url-link as a bookmark/favourite	3.40 (1.96)	2.45 (1.68)	2.37 (1.52)	3.65 (2.13)	2.24 (1.69)	1.45 (0.95)	4.33 (2.42)	28.57**
		Save the whole Website as a file	1.83 (1.39)	1.68 (1.21)	1.52 (0.98)	1.64 (0.93)	1.56 (1.18)	1.86 (1.25)	2.00 (1.67)	3.61
		Save the reference in a database-storage-function	1.17 (0.75)	1.36 (0.85)	1.29 (0.89)	1.07 (0.27)	1.31 (0.80)	1.34 (0.86)	1.00 (0.00)	4.03
	Save the reference physically		3.20 (1.71)	2.68 (1.55)	2.56 (1.36)	2.50 (1.45)	2.47 (1.65)	3.76 (1.86)	3.33 (1.97)	16.66*
		Print the reference	2.00 (1.36)	2.09 (1.48)	2.10 (1.50)	2.00 (1.47)	1.81 (1.38)	3.14 (1.98)	2.17 (1.94)	14.88*
		Write down the reference	3.37 (1.75)	2.95 (1.79)	2.29 (1.30)	3.14 (1.83)	2.05 (1.47)	3.17 (1.97)	3.33 (1.86)	26.07**
Search the article again, knowing which key-words to			2.80 (1.24)	3.18 (1.26)	2.50 (1.21)	3.21 (1.63)	3.26 (1.41)	2.41 (1.05)	3.17 (1.17)	17.97**

use in
which
database
(Note: **p<0.01, *p<0.05)

Table 2: Mean values, standard deviations (within parentheses) and U-values (Mann-Whitney) for sex, types of article and reference management process.

Reference management process			Men	Women	U-value
Save the article			5.03 (1.77)	5.07 (1.75)	8202.50
	Save a printed copy of the article		3.15 (1.67)	3.84 (1.91)	6612.00**
	Save a digital copy of the article		4.98 (1.83)	4.78 (1.88)	7801.00
		Attach the article to an e-mail	2.87 (1.69)	3.41 (1.83)	6934.00*
		Upload the article on a cloud platform (e.g., Dropbox)	2.81 (2.04)	2.01 (1.66)	6463.50**
		Save a copy on your computer's hard disc	4.76 (1.85)	4.25 (1.93)	7024.50*
		Save a copy on a portable storage device	2.91 (1.75)	2.73 (1.57)	7952.00
		Copy parts of the article and paste them in a new document	2.15 (1.37)	2.30 (1.41)	7888.00
Save the reference			4.67 (1.96)	4.99 (1.76)	7684.00
	Save the reference digitally		4.46 (2.05)	4.62 (2.02)	7969.00
		Save the url-link in an e-mail and send it to yourself	2.35 (1.54)	2.73 (1.77)	7383.50
		Save the reference and send it to yourself	2.22 (1.44)	2.87 (1.73)	6461.50**
		Save the reference in a bibliographic management system	2.25 (2.03)	2.05 (1.98)	7891.00
		Save the reference in a file on your computer	3.14 (2.06)	3.32 (1.79)	7799.00
		Save url-link in a file on your computer	2.30 (1.74)	2.29 (1.60)	8111.50
		Save the url-link as a bookmark or favourite	2.38 (1.74)	2.47 (1.78)	8069.00
		Save the whole Website as a file	1.59 (1.18)	1.66 (1.17)	7861.00
		Save the reference in a database-storage-function	1.36 (0.91)	1.23 (0.73)	7890.00
					5951.00**

Save the reference physically		2.20 (1.45)	3.01 (1.69)	
	Print the reference	1.74 (1.24)	2.23 (1.64)	6919.00*
	Write down the reference	2.02 (1.48)	2.76 (1.69)	6189.50**
Search the article again knowing which key-words to use in which database		3.19 (1.44)	2.85 (1.29)	7275.50

Note: **p<0.01, *p<0.05

Post-hoc tests (Mann-Whitney-U-test with Bonferroni correction for multiple comparisons) showed that students of nursing are significantly more inclined to save full-text articles than students in jurisprudence and social sciences (U=147.00, p=0.01) or those studying medicine or odontology (U=651.50, p<0.01). Students of medicine and odontology keep articles significantly less frequently than science students (U=1682.00, p<0.01). Nursing students keep paper copies of an article more often than others (p<0.01) except art students. Science students tended to keep a digital copy of an article more often than students of nursing (U=405.00, p<0.01), and medicine and odontology (U=1980.50, p<0.01). Social science students were, on the other hand, more inclined to copy and keep extracts of texts than students of nursing (U=139.00, p<0.01) or medicine and odontology (U=752.00, p=0.01). Similar differences in practices could be observed throughout the material.

The study also concluded that 86% of the surveyed graduate students are using scholarly articles. Regarding their information management, it is as common to store the whole article as it is to store the reference (average score 5.06 vs. 4.89 on 7-point Likert scale). Further it is more common to choose electronic storage methods for articles and references than to use physical methods. The results highlight that most of the students use several method types and use them to varying extents. Neither age, computer skills, duration of study, nor satisfaction with their way of information storage influenced the quantity of used methods. Regarding specific handling, the storing of article copies on the computer's hard drive were most frequently used. The respondents preferred furthermore to read the articles on a screen rather than printed paper versions. The influencing factors of gender, age, computer skills and subject discipline were affecting the choice of methods. General conclusions about these influencing factors are, however, complicated by likely confounders. Moreover, the method types were used to different extents depending on subject discipline.

From the perspective of the continuum of personal information, the variation of practices in the study population provides evidence of how different students manage and conceptualise this particular type of information at the time of collecting it. Even the disciplinary variation can be undoubtedly explained by the methodological traditions of different academic departments and disciplines. The diversity of significant factors suggests diverging beliefs and preferences of organizing and pluralising the emerging personal information collection in the context of the thesis work. The answers to two open-ended questions confirmed the mix of beliefs and motivations. Respondents described their motivation by referring to laziness, habits, lack of reflection, time and skills, and particular skills and interests (information management, computer skills, particular applications) possessed or learned by participating in a course.

The different approaches of keeping full-text articles, taking notes or keeping references have direct consequences on how the information can be organized, used and pluralised in the future, and what types of uses the students anticipate. Keeping a full-text copy of an article allows more versatile use of the material as information but in contrast to references and text extracts, the approach can make it difficult to get an overview of the material and, for instance, to find a particularly interesting piece of information from the text mass. The method of the case study did not allow an in-depth analysis of how the informants reflected on the anticipated pluralisation of captured information, but the individual responses to open questions on the survey instrument tended to underline the informational aspects of the texts, e.g., '*I am afraid of losing important information and where I found it, so I am good at saving it in many places at the same time!*'. In this particular case the respondent was anticipating using the information in the future and the fear of losing the information seems also to suggest that the respondent was uncertain where, when and perhaps how the information might be useful. Other respondents were also anxious about losing their information and gave some indications of at least implicit assumptions that the information might be useful in the future for themselves (e.g., '*Sometimes I store article files on different computers, just as a back up*') or their fellow students (e.g., '*Sometimes I send relevant articles to fellow students via e-mail or Skype*'). Another indication of the presence of a continuum of information use was given by a respondent who described their management of articles: "I paste the reference into the

draft version of my paper even if I am not sure if I will cite the article. The reference list in my paper is both a real reference list and a kind of reading list for myself". After the paper was created as a scholarly article, it was captured by the student as a part of a draft version of a course paper, organized in a reference list, and pluralised (or used) as both a list of references for the paper and a reading list.

Case 3

The third case study investigated personal digital archives, their acquisition and management at major Swedish archival institutions, by interviewing archivists and librarians, and by studying personal digital collections currently held by archival institutions. All institutions had experience with individual personal born-digital collections but none of them had worked with such collections to a large extent.

The results of the study showed that the practices of the donors of born-digital personal archives did not correspond well with the archival practices and this made personal collections difficult to manage from the archivists' point of view. A survey of the current digital personal archives at the major Swedish archival institutions showed a variety of problems. Files may be lacking suffixes that identify the file format and some personal files may be password protected. Personal collections are often lacking details on file formats and information on the different versions of files and information is often scattered over many different digital storages devices and folders. In case of the personal archive of Nils-Eric Sjödin (1934-2009) at the Umeå Research Archive, the archive consisted of several computers. In spite of considerable effort the data on the oldest one was inaccessible by the time of the study. When deposited with an archival institution, the lack of information on how to access the documents and their content makes long-term preservation and future use of the collections difficult for archivists, historians and other potential users of the data. Further problems may relate to the information itself. People create personal information and capture it, but at the same time, they capture public information and information that is personal or related to particular communities, groups and organizations. Also the diversity of methods of capturing and organizing that information complicates its management at archival institutions.

From the point of the view of the continuum of personal information, the individuals tend to prioritise immediate informational and topical uses of documents. It is difficult to see that the contents of a hard disc or USB-key might end up in an archival institution when the documents are being created. Therefore, the capturing of the information becomes difficult and even more so the organization and use or pluralisation of a heterogeneous collection including different physical storage media and file formats.

A closer study of the archive of the Swedish author Peter Nilson (1937-1998), archived at the special collections department of the Uppsala University Library, highlighted many of the issues underlined by interviewees. The collection had been archived basically as it was donated and it was obvious that the collection was not originally intended to be a formal personal information collection. With this particular, rather recent, archive, the original file formats and storage media did not (yet) constitute a major hindrance to access. In contrast, the inconsistent naming conventions of WordPerfect files without standard endings made it difficult to correctly recognise their file type. Multiple copies of individual files, backups and different versions in the archive also made it difficult to get an overview of the size and contents of the archival collection. Informants underlined the necessity of having proper descriptions of collections (informant 2). Users need them to assess the collections and get a "reliable" idea of their contents. Good organization and description of the collections are necessary prerequisities for use and usability of collections.

The pluralisation of the born-digital personal archives was discussed by the informants largely from the traditional perspective of historical research. The interviewees did, however, identify the flexibility of possibilities for the uses of digital material as potential challenges for making the materials available. Free access to manuscripts of recently deceased authors would violate the rights of the copyright owners and other similar issues can easily lead to a paradoxical situation, as one of the informants noted, that because the material is already available in digital format and does not need to be digitised, '*we begin to think that we cannot put this out for various reasons. We have to limit access to the materials!*'. Even if the informants mentioned a large number of practical and technical problems with the management of born-digital personal archives, they were largely positive regarding the possibilities of managing the collections if there was enough institutional support and resources to solve the problem.

None of the informants had experience or knowledge of radically proactive work actively collecting born-digital personal collections for the archive. Archivists had, however, in several cases been in contact with donors of personal archives in advance during their lifetime and cooperated with them on the management of archival records (e.g., informant 5).

The aim of analysing the material from the three case studies was to find contextual axes that constitute the relevance and assumed implicit and explicit purposes of particular types of practices. The original records continuum model conceptualised a particular process (recordkeeping) of managing particular types of documents (records) through four axes of identity, evidentiality, transactionality, and recordkeeping containers penetrating through the dimensions of create, capture, organize, and pluralise. The analysis of the personal information management practices show that the same four dimensions are relevant also in the context of the management of (personal) information, but that the axes that constitute the relevance of the continuum of the dimensions can vary between different types of processes on the continuum.

The practices identified in the three case studies (discussed in more detail above) are summarised in Table 3 using the dimensions of the continuum model as a frame of reference. The variety of practices in the context of the different dimensions show the diversity of ways that documents and information are conceptualised when they are being created, when individuals capture them as a part of their personal information collections, and organize the collections according to their personal preferences and anticipated future uses. Finally, the pluralise dimension shows that personal information can be used for a variety of anticipated and unanticipated purposes by the individuals themselves and by others. As a whole, the analysis of the different dimensions of the records continuum model gives an overview of the continuum of the management of personal information and indicates how different uses are anticipated, and in many cases unanticipated, at the moment of creating, capturing, organizing, and pluralising personal information.

Table 3: The four dimensions of records continuum in the three case studies.

	Create	**Capture**	**Organize**	**Pluralise**
Case 1	By sound-artists themselves; by others: Web texts; images; printed books; CDs; DVDs.	On computer; using MiniDiscs, tapes; physical material e.g., in boxes in attic; no capturing, but re-finding on the Web.	Rigorous or less rigorous schemes of organization; in folders, external hard discs, diverse analogue media.	1. As an information resource for on-going and/or new projects; 2. As a serendipitous source of inspiration.
Case 2	By publishing scholars.	Digitally and/or as printouts: full text, reference, extract.	Text/note file, reference management software.	In thesis work: as a reference (evidence); as topical general information.
Case 3	By individuals themselves.	In diverse digital formats depending on the software used by the individual.	Diverse schemes of organization; often rather disorganized.	As historical evidence of past activities; topical historical information.

- Informativeness (Cases 1, 2 and 3)
- Inspirationality (Case 1)
- Communicativeness (Cases 1 and 3)
- Topicality (Cases 2 and 3)

The axis of informativeness relates to how the informational scope of the documents evolves on the continuum. How the process of managing personal information fixes a document as being informative in a particular sense, for instance, as a carrier of useful information for thesis work, as informative of the life of a particular person or of the practical usefulness of a particular piece of information for an artist.

Inspirationality refers to how particular documents are fixed as sources of inspiration. The presence of the axis was most apparent in the artists' use of their personal collections as a source of inspiration rather than information.

The aspect of communicativeness could be identified in the first case study in the cases when the informants described how their information management strategies had changed or were different when they were actively collaborating with others, instead of managing information merely for their own personal use. Communicativeness and the desire to make materials available could also be seen as a partial factor that might have motivated donors to make available their, or their relatives', personal archives.

Finally, the axis of topicality was obvious in two of the three case studies. The capturing of scholarly articles in personal collections fixed them as related to a particular topic or area of interest of the individual student. Similarly, the appropriation of personal information collections as personal archives fixed (in practice, even if not necessarily from the archive theory point of view) their topicality as primarily historical evidence of the particular individuals and their work.

The analysis also highlighted the relevance of the axes of identity and (recordkeeping) containers (from the records continuum model) in all case studies. The appreciated identity of the original authorship of the information both influenced, and was influenced by, how individuals captured, organized and pluralised information in the case studies. The identities carried by sound clips and references shifted from being authored creations to representants of phenomena and genres, and finally cultural artefacts in the sense of being sources of inspiration. In a similar manner, personal notes and belongings become institutionalised in archival institutions. Containers had a similar tendency to evolve from being individual documents to become contextualised as parts of personal collections, of topical lists of references and documents containing extracts, and of personal archives.

We could also identify the records and recordkeeping related axes of evidentiality in case studies 2 and 3, and transactionality in case study 3. In addition to an informational function, personal archives and literature references are also carriers of evidence. Personal archives provide evidence of the life and undertakings of individuals, whereas a literature reference to a scholarly work is evidence of a particular scholarly study and that this particular work has been consulted by the author of a thesis. The presence of recordkeeping related contextual axes in case study 3 was obviously related to its focus on the convergence of personal information management and archival practices. Because of the overlap of the continuum models of Upward, the various axes of information, information systems and publishing models could also be identified in the material. The process of the structuration of personal information has implications in the spheres of technology, memory, levels of categorisation and framework of the action/structure. Similarly, the structuration has implications and counter-implications for the granularity of data storage, data modelling, and the linkage and authority of the information to cross boundaries between different communities. The sociological structuration of personal information proceeds together with the structuration of the technical and conceptual infrastructure. When sound artists aim to make an impact in a wider community, they select different methods for the organization of information. Similarly, a personal information collection needs to be structured on a new conceptual and technical level to be useful as a personal archive. It seems that the process of structuration proceeds on multiple axes, but it seems that the process tends to be guided by some particular axis that constitutes the process, as, for instance, record-keeping, information management, serendipitous encountering or communication.

Discussion

Continuum approach in the context of personal information management

The analysis of the findings of the empirical studies provides rich evidence of the shifting contextualities of personal information management. We argue that continuum thinking provides a useful theoretical basis for explicating personal information management as a process of Giddensian time-space structuration, similarly to how Upward argued that the records continuum theory is useful in the context of explicating the recordkeeping process, and in more general terms, providing a framework for theorising particular types of document-centric management processes (Upward, 2000).

In contrast to the earlier information- and media-centricism of research and its focus on individual organizations and short, rather than longitudinal, research (criticised by e.g., Fourie, 2011 and Whittaker, 2011), the continuum approach places emphasis on the spatial and temporal longevity of personal information practices. The creation, capturing, organization, and use of personal information never happens in contextual isolation. The continuum approach does not deny the influence of technology, but leaves room for a contextually more open view (formulated by Orlikowski, 1992) of the duality of its nature as a social construct and a constitutive force. This view of technology is closer to the empirical observations of personal information management literature of the richness of user behaviour and the relative poverty of the affordances provided by the tools they use (e.g., in Jones and Teevan, 2007, p. 157).

The major contextual difference between recordkeeping (and other continuum models suggested by Upward, 2000) and personal information management relates to their perspectives. Even if the original records continuum model emphasises plurality, being an archival theoretical model, it explains the classical model of recordkeeping and follows archival tradition by privileging the creation of specific types of documents, records, (dimension: create) and their participation in the archival process (capturing and organizing in the context of archiving and recordkeeping). Conceptualising documents as records and the process of capturing, organizing, and pluralising documents as recordkeeping is, however, only one alternative. In a similar manner, Upward's (2000) view of the information continuum model is specific to a related idea of the management of information in terms of the classical knowledge and information management orthodoxy of turning tacit knowledge explicit by capturing it in an information system and pluralising it by the means of a relatively straight-forward process of standardisation. The traditional view of information and knowledge management

has been criticised in the literature of inflexibility, neglect of pluralism (Fortunati *et al*., 2012; Day, 2012), and from an empirical point of view, of a poor fit with actual information practices of people (e.g., von Krogh, 2012). Regardless, the perspective obviously builds on a particular view of information and its management that is as specific as the conceptualisation of documents as records and their management as recordkeeping.

The contextual specificity of the records continuum model and the additional continuum models of Upward and colleagues is a simultaneous strength and weakness. Selecting a particular processual context and a perspective of documents/information is necessary for the development of a prescriptive model. The approach is, however, less useful if the model is used as an analytical tool. The apparent plurality of personal information and management practices suggests that assuming a less specific approach with the Giddensian structural dimensions, but an arbitrary selection of contextual axes of continuum, could be more useful as a first analytical approach. The case studies show that especially in the highly non-normative context of personal information management, a strict compliance to the models of Upward leads to the conclusion of much of the earlier research: that individuals are not behaving (from a rationalistic point of view represented by the model) in a sensible manner. However, when the analysis acknowledges the potential relevance of the continuum of other factors (axes), it is easier to see why people manage their personal information as they do. For instance, the inspirational collecting of information as part of the work of the sound artists in case study 1 does not necessarily warrant the meticulous organization of information that would be preferable from the point of view of an archivist who struggles with the heterogeneity of digital personal archives. Consequently, it might be easier to develop measures to help them or to promote the usefulness of personal information for other purposes (such as personal archiving in case study 3).

Finally, another difference between the records continuum model and the specific context of personal information management relates to their individual versus collective perspectives. Records continuum and structuration theory are essentially societal models whereas personal information management focuses on individuals. The records continuum model (and Upward's information continuum model) focuses on how recordkeeping processes create and reconstitute collective structures. In contrast, the continuum perspective of the management of documents underlines the dialectic of control in Giddens' theory. Agents are able to intervene in the collective sphere or to refrain from such an intervention (Giddens, 1984). Unlike recordkeeping or information management in the sense of Upward, the principal focus of personal information management is not that of the structuration of a particular society but that of creating and reconstituting the personal self within the diverse societies and social constellations in which an individual participates. This clash of perspectives was especially visible in case study 3. When individuals' born-digital personal information collections are brought to an archival institution, the patterns of individuals' collections management are not automatically obvious and approachable for the archivists and the potential users of the personal archives.

Information on a continuum

Capture is the focal point when a document is fixed (i.e. captured or salvaged) as a record in the records continuum model (Upward, 2000). A similar focal point of personal information management is the moment when particular information is fixed as personal information, for instance, when a person decides to save a used concert ticket instead of throwing it away. Information (including its physical manifestations) often lives longer than it is used as personal information. Books, sounds and scholarly articles exist before they are captured as personal information and even the most personal creations such as letters, e-mails and literary manuscripts can live extended periods of time as part of personal archives.

The fixing of information is independent of its original form and use. A private personal creation, published book, scholarly article or Web page can all be fixed as personal information. Further, as the case studies show, a particular piece of information can simultaneously be captured as a part of a personal archive or a list of personally relevant scholarly articles and be used by others as a publishable literary text, a line in a conversation or as a part of a large scholarly digital library. Even if the individuals would not necessarily conceptualise their personal collections in personal information management terms as personal information collections, the act of capturing fixes the documents as personal information similarly to how archiving fixes documents as records. The moment of capturing information as personal information is also key to understanding whether a particular piece of information is personal or not. In all case studies, the personal information (even when it was personal in the sense of being about an individual) was simultaneously explained (Giddens, 1984) as being personal. Case study 1 showed how the understanding of information as (at least partially) shared shaped the way it was captured and organized by the informants. The to-be-shared information was managed in a different manner than the to-be-personal information.

Even if the moment when a document is fixed has a special significance in a recordkeeping process, the records continuum model underlines in general the significance of the earlier phases of the continuum for the later usability of the records as evidence of particular transactions. The way we manage our personal information, to a certain extent, also shapes the way we think. Bruce (2004) notes that when we try to solve a problem we first look in our personal information collection. In this regard, personal information management is a tool for thinking and decision-making (as for Lars and Anders in case study 1), and the way that the personal information collection is organized has a strong impact on what kind of information we access and use; the organization of the personal information collection can either obscure or highlight information, and allows us to control what we remember and what we forget. The explicit and implicit choices and assumptions at the stage when information is created influence how it can be captured, organized and pluralised in the future. In practice, it is possible to argue that the success of personal information management depends on how closely the earlier stages of the process of managing personal information are related to the later attempts to, for instance, organize or pluralise the information.

Information collections on a continuum

The findings also confirm earlier observations that personal information collections are in a constant state of change. Gwizdka (2006) has conceptualised the fluctuations of personal information collections (or, personal spaces) in terms of a feedback loop. In contrast to earlier observations, however, our analysis highlights the fact that every addition and removal of information items changes the collection as a whole. Case study 1 showed that artists utilise this shifting for reminding purposes; the potential of an information item often becomes visible in light of a new or transformed context and when this happens the collection, as a shifting context for the information item, becomes a tool for thought. The case study also showed that forgetting about information plays an integral role in the collection-as-tool since it allowed for serendipitous browsing in the personal information collection, and that artists generate ideas by deliberate and accidental recontextualisation of documents. Similar collection level shifts could also be identified in case study 3. Individual documents and even the possibility of the existence of particular types of documents (e.g., private information or copyrighted material) changed how the personal information collection was conceptualised and managed by the archivists.

Use of personal information on a continuum

The structure of a personal information collection can also be a key to understanding the implications of personal information on an individual level and how it influences the creation and reconstitution of the social fabric, a question that is closely related to Fourie's (2011) urge to focus on the contextual aspects of personal information management. The pluralisation of a personal information collection is simultaneously dependent on the types of implications and meanings attached to it in specific situations (as in the case of the sound artists' use of their often only sparsely organized collections and their use as a creative tool). Also on broader generic assumptions on how things might be useful now and in the future within a particular frame of reference (e.g., that of how scholarly literature is used in thesis work, or how personal archives are supposed to be useful in historical and heritage contexts).

The continuum perspective can also help to understand the earlier observed paradox of personal information that relates to its often indirect rather than direct usefulness (Malone, 1983; Barreau, 2006). Instead of the information itself, the usefulness of (personal) information and activity in different contexts is dependent on the opportunities the information can provide. The records continuum theory emphasises the importance of the impact that shifting context has on the usability of records. This non-linearity was apparent in the study of artists which showed that a sparked idea constitutes a contextual shift for the personal information collection; for example, a new idea for a project can shed new light on old material, rendering it useful. The case study showed that the personal information collections enable artists to nurture many ideas over long periods of time, and that artists often pick up previously abandoned ideas and projects after seeing a place for them in the context of a new project. This use highlights that the continuously shifting context plays an important role in the creative thought process, and that the context has a strong impact on the actual use of collected material; artists often use material collected months and years earlier for purposes other than the original one. Considering this, the assumptions of records continuum about the layered and multiple purposes and contexts of records seem very appropriate in the context of personal information management.

The central premise of personal information management, to cater for findability (and even usability), is often defined in the literature as an opportunity for a rather poorly elaborated person, with little or no consideration of her information practices (Fourie, 2011). The case studies show how personal information, similar to documents and records (according to the records continuum model), are capable of providing opportunities for the individual herself, but when structured appropriately, fixed as a particular type of document and a part of a particular process, they become usable for multiple

individuals and groups. The usefulness, whether informational, evidential or inspirational, may be conceptualised as memory opportunities. In this context memory should be understood more broadly, not as a thing but (as Upward and McKemmish, 2001 note) as a process within the adaptive learning system of Bowker and Chou (2009), that of recalling and using particular earlier (either personally or collectively) known resources. These opportunities are exemplified in the case studies by the potential informativeness of information, the capability of personal information collections to inspire sound artists and the apparent implications of the varying strategies of students in their management of scholarly articles.

A consequence of the difficulty in seeing the potential usefulness of specific pieces of personal information is the reluctance to engage in personal information management because of the difficulty of conceptualising any apparent benefits of the effort. As Marshall (2007) has noted, in principle, people tend to be happy to assume a curatorial responsibility of their personal information collections but in practice people rarely engage in any coherent management of their digital belongings.

The difficulty of anticipating the benefits of personal information management depends on multiple factors. As the case studies and earlier literature show, the usefulness of personal information for individual and collective pursuits is influenced by multiple factors, in terms of the continuum model, by the level of structuration of the assets. Recordskeeping containers or data storage can determine whether a particular piece of information is considered useful or not, whether it is fit for a purpose. In case study 1, the difficult to access materials were unusable because of their outdated technical format. At the same time, the technical inaccessibility excluded them from personal and social processes. They did not have an impact or had only a very limited capability to influence anything because they were difficult to organize and pluralise any further. Earlier research has made similar observations of the affordances of document types, for instance, how the form of a paper document or the capabilities of specific computer-based tools partly determine their applications, usability and the possibility to re-access and combine them in new ways (Jones and Teevan, 2008, p. 7-8). Case study 1 showed also, in contrast to earlier suggestions of the mainly negative implications of the fragmentation (Henderson, 2011; Bergman *et al*., 2006), that the easiness, relative difficulty and impossibility of accessing certain materials could help informants to navigate their collections and to choose what information to access or not.

Personal information management practices on a continuum

The final benefit of the continuum approach is that it can reduce the gap between descriptive and prescriptive research (Diekema, 2011) by providing a framework for relating individual empirical findings and experimental designs to each other, in a temporally and contextually extended frame of reference. First, the continuum model underlines the need to remember the reciprocal structuration of tools and practices. The suggestion of Diekema (2011) to design tools that match actual behaviour is only a partial solution. In addition, it would be necessary to consider the implications of the use of these tools, as people use, manage and seek information. It would be helpful to consider personal information management practices as activities that make information more findable, as Malone (1983) remarked already in the early 1980s, and as Barreau (2006) notes, that make it easier to remember. The continuum perspective highlights the necessity of considering the tools and their influence in a broader perspective. Continuum thinking underlines the benefits of understanding how the tools are used and how they might influence contemporary personal information management practices, and the future possibilities to use (or in terms of the continuum model, pluralise) information in various conceivable contexts represented by the different (e.g., evidential, informational or inspirational) axes of the continuum. An explicit focus on the continuum of personal information management could be helpful in avoiding the emergence of such personal information collections that are never accessed or used, such as the difficult to access collections in the case study 1, personal archives complete with several computers in case study 3, or the collections of bookmarks of Web pages never used by their creators in the study of Boardman and Sasse (2004). The faith of students in their reference collections in case study 2 is obviously unknown, but it is obvious that the different methods of keeping references, excerpts or full-text articles have a major impact on how they can be used in the future as evidence, information or perhaps even memorabilia. In addition to providing tools for storing different types of information and structuring it, personal information management tools should also help individuals to plan for its future use. In this planning, the dimensions of the continuum model can help to identify critical moments when personal information is about to extend its context of relevance.

Secondly, the case studies show that in terms of the continuum model, the perceived or anticipated significance of dimension 4 (pluralise) issues makes people put effort into dimensions 2 (capture) and 3 (organize). People are likely to put more effort into the capturing and organization of their personal information collections if they can anticipate how they might benefit from its pluralisation. In the field of personal archives, authors such as Cox (2008, 2011) and

Marshall (2008a) have for some time purported the significance of proactive management of archives. The continuum model helps to explain how and why proactiveness and the process of optimal remembering (combining the notions of Bowker and Chou, 2009 and Csikszentmihalyi, 1990) might be useful for both the management of personal archives and personal information. A small effort made in the first and second dimensions of the model pays off well in the third and fourth dimensions in terms of reduced effort, time and resources in trying to access files on Minidiscs (case 1) or old computers (case 3), or trying to retrieve the full-text of an article (case 2). An early engagement in the continuum of personal information might help to save some personal information collections from oblivion and to make them more useful for foreseeable future uses. Jones and Teevan (2007, p. 92) assert that an appropriately designed personal digital collection could significantly empower people in their daily lives because memories are critical to nearly every activity people perform. The benefit of the continuum approach is its focus on the relevance of any attempts to anticipate that which might be relevant to remember. Both archivists and other potential users of the information (including the creator herself) find themselves in an inferior position if they engage with information from the pluralisation perspective first, when it has already been created, captured and organized in some particular manner in an e-mail program, a word processing file or sound file. In simple terms, if the management of a personal information collection of a sound artist or personal archive of an individual is informed by the continuum model and the cumulative (or progressive) nature of structuration, the collections could be expected to be more closely embedded in diverse societal constellations and from the perspective of individuals and communities, and more useful in the future.

Conclusions

The present study discussed the interplay of the contextual continuities of personal information management practices in the light of continuum thinking based on the record continuum model of Upward *et al*. (e.g., Upward, 1996, 1997, 2000; McKemmish, 2001). We have shown, using findings from three empirical case studies, how theorising the continuum approach, and conceptualisation of diverse contextual aspects of personal information management as axes on a Giddensian spatio-temporal continuum, can help to understand the contextual changes and continuities of personal information management and use. We argue that the records continuum model provides a useful theoretical basis for explicating personal information management as a process of Giddensian time-space structuration, similarly to how Upward argued that the theory is useful in the context of explicating the record-keeping process and, in more general terms, providing a framework for theorising particular types of document-centric management processes (Upward, 2000).

Acknowledgements

This article is part of the Expanding horizons of Personal information management research project at the Department of ALM, Uppsala University. The case studies were conducted as a part of the authors' (2,3 and 4) MA thesis work. The authors would like to extend their gratitude to Allison Gerber for revising the language of the article manuscript.

About the authors

Isto Huvila is a Senior Lecturer in information management at the School of Business and Economics, Åbo Akademi University in Turku, Finland and an associate professor at the Department of ALM (Archive Science, Library and Information Science, and Museology) at Uppsala University in Sweden. His primary areas of research include information work and information management, knowledge organization, documentation, and social and participatory information practices. He received a MA degree in cultural history at the University of Turku in 2002 and a PhD degree in information studies at Åbo Akademi University (Turku, Finland) in 2006. He can be contacted at: isto.Huvila@abo.fi
Jon Eriksen is a Technology & Special Programs Librarian at the New Canaan Library in New Canaan, CT, USA. He completed a MA in library and information science at the Department of ALM at Uppsala University in 2012.
Eva-Maria Häusner is a librarian at the National Library of Sweden. She completed a MA in library and information science at Uppsala University in 2012.
Ina-Maria Jansson is an archivist at Västerås City Archives. She completed a MA in archival science at the Department of ALM at Uppsala University in 2013.

References

- Barreau, D. (2006). *Personal information management in context.* Paper presented at the at the 2006 ACM SIGIR Workshop on Personal Information Management in Seattle, Washington, August 10-11, 2006. Retrieved

from http://pim.ischool.washington.edu/pim06/files/barreau-paper.pdf (Archived by WebCite® at http://www.webcitation.org/6NpGCZc18)
- Barreau, D., O'Neill, L. & Stevens, A. (2009). Research and practice: what are we teaching about personal information management? *Proceedings of the American Society for Information Science and Technology, 46*(1), 1-4.
- Bergman, O., Beyth-Marom, R. & Nachmias, R. (2006). The project fragmentation problem in personal information management. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, (pp. 271-274). New York, NY: ACM Press.
- Boardman, R. & Sasse, M. A. (2004). Stuff goes into the computer and doesn't come out: a cross-tool study of personal information management. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, (pp. 583-590). New York, NY: ACM Press.
- Bowker, G. & Chou, R.-S. (2009). Ashby's notion of memory and the ontology of technical evolution. *International Journal of General Systems, 38*(2), 129-137.
- Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3* (2), 77-101.
- Bruce, H., Jones, W. & Dumais, S. (2004). Information behaviour that keeps found things found. *Information Research, 10*(1), paper 207. Retrieved 13 December, 2013 from http://InformationR.net/ir/10-1/paper207.html (Archived by WebCite® at http://www.webcitation.org/6MRTtKaZr)
- Chatti, M. A. (2012). Knowledge management: a personal knowledge network perspective. *Journal of Knowledge Management, 16*(5), 829-844.
- Cook, T. (1997). What is past is prologue: a history of archival ideas since 1898, and the future paradigm shift. *Archivaria, 43*(1), 17-63.
- Cox, R. J. (2008). *Personal archives and a new archival calling*. Duluth: Litwin Books.
- Cox, R. (2011). Appraisal and the future of archives in the digital era. In Jennie Hill, (Ed.). *The future of archives and recordkeeping: a reader* (pp. 213-237). London: Facet Publishing.
- Csikszentmihalyi, M. (1990). *Flow : the psychology of optimal experience.* New York, NY: Harper & Row.
- Davenport, E. (2010). Confessional methods and everyday life information seeking. *Annual Review of Information Science and Technology, 44,* 533-562.
- Day, R. E. (2012). Network mediated discursive education: from computational to networked knowledge in the university. *The Information Society, 28*(4), 228-235.
- Dever, M., Newman, S. & Vickery, A. (2011). The intimate archive. *Archives and Manuscripts, 38*(1), 94-137.
- Diekema, A. R., Holliday, W. & Leary, H. (2011). Re-framing information literacy: problem-based learning as informed learning. *Library & Information Science Research, 33*(4), 261-268.
- Elsweiler, D., Ruthven, I. & Ma, L. (2006). *Considering human memory in PIM*. Paper presented at the at the 2006 ACM SIGIR Workshop on Personal Information Management in Seattle, Washington, August 10-11, 2006. Retrieved from http://pim.ischool.washington.edu/pim06/files/elsweiler-paper.pdf (Archived by WebCite® at http://www.webcitation.org/6NpGqAX9B)
- Elsweiler, D. (2009). Review of the book *Keeping found things found: the study and practice of personal information management*, by W. Jones. *Journal of the American Society for Information Science and Technology, 60*(8), 1725-1727.
- Elsweiler, D., Baillie, M. & Ruthven, I. (2011). What makes re-finding information difficult? A study of e-mail re-finding. In P. Clough, C. Foley, C. Gurrin, G. Jones, W. Kraaij, H. Lee & V. Mudoch (Eds.), *Advances in information retrieval*, (pp. 568-579). Berlin: Springer. (Lecture Notes in Computer Science, Vol. 6611)
- Fourie, I. (2011). Personal information and reference management: librarians increasing creativity. *Library Hi Tech, 29*(2), 387-393.
- Fortunati, L., Larsen, S. E. & Stamm, J. (2012). Introduction to the special section on knowledge management in postmodern society. *The Information Society, 28*(4), 201-207.
- Gandy, O. H. (2011). The political economy of personal information. In Janet Wasko, Graham Murdock & Helena Sousa, (Eds.). *The handbook of political economy of communications* (pp. 436-457), Chichester, UK: Wiley-Blackwell.
- Giddens, A. (1984). *The constitution of society: outline of the theory of structuration.* Cambridge: Polity.
- Glaser, B. G. & Strauss, A. L. (1967). *The discovery of grounded theory: strategies for qualitative research.* Hawthorne, NY: Aldine.
- Gorman, G. & Pauleen, D. J. (2011). The nature and value of personal knowledge management. In D. Pauleen, & G. Gorman (Eds.), *Personal knowledge management: individual, organizational and social perspectives* (pp. 1-16). London: Gower.
- Gwizdka, J. (2006). *Finding to keep and organize: personal information collections as context.* Paper presented at the at the 2006 ACM SIGIR Workshop on Personal Information Management in Seattle, Washington, August

10-11, 2006. Retrieved from http://pim.ischool.washington.edu/pim06/files/gwizdka-paper.pdf (Archived by WebCite® at http://www.webcitation.org/6NpHZzuOs)
- Harris, V. (2001). On the back of a tiger: deconstructive possibilities in evidence of me. *Archives and Manuscripts, 29*(1), 8-22.
- Hemminger, B. M. & Niu, X. (2012). A study of factors that affect the information-seeking behavior of academic scientists. *Journal of the American Society for Information Science and Technology, 63*(2), 336-353.
- Henderson, S. (2011). Document duplication: how users (struggle to) manage file copies and versions. *Proceedings of the American Society for Information Science and Technology, 48*(1), 1-10
- Jones, W., Dumais, S. & Bruce, H. (2002). Once found, what then?: a study of "keeping" behaviors in the personal use of web information. *Proceedings of the American Society of Information Science and Technology, 39*, 391-402.
- Jones, W. (2007). Personal information management. *Annual Review of Information Science and Technology, 41* (1), 453-504.
- Jones, W. P. & Teevan, J. (2007). *Personal information management*. Seattle, WA: University of Washington Press.
- Jones, W. (2008). *Keeping found things found: the study and practice of personal information management*. Burlington, MA: Morgan Kauffman.
- Liu, Z. (2006). Print vs. electronic resources: a study of user perceptions, preferences, and use. *Information Processing and Management, 42*(2), 583-592.
- Liu, A. (2010). *Laws of cool: knowledge work and the culture of information*. Chicago, IL: University of Chicago Press.
- Lund, N. W. (2009). Document theory. *Annual Review of Information Science and Technology, 43*, 1-55.
- McKemmish, S. (1996). Evidence of me... *Australian Library Journal, 45*(3), 174-187.
- McKemmish, S. (2001). Placing records continuum theory and practice. *Archival Science, 1*(4), 333-359.
- Malone, T. W. (1983). How do people organize their desks?: implications for the design of office information systems. *Transactions on Information Systems, 1*(1), 99-112.
- Marshall, C. C. (2007). How people manage personal information over a lifetime. In W. P. Jones, & J. Teevan (Eds.), *Personal information management* (pp. 57-75). Seattle, WA: University of Washington Press.
- Marshall, C. C. (2008a). Rethinking personal digital archiving, part 1: four challenges from the field. *DLib, 14* (3/4). Retrieved from http://www.dlib.org/dlib/march08/marshall/03marshall-pt1.html (Archived by WebCite® at http://www.webcitation.org/6MRUCoIFT)
- Marshall, C. C. (2008b). Rethinking personal digital archiving, part 2: implications for services, applications, and institutions. *DLib, 14*(3/4). Retrieved from http://www.dlib.org/dlib/march08/marshall/03marshall-pt2.html (Archived by WebCite® at http://www.webcitation.org/6MRUKyiVf)
- Orlikowski, W. J. (1992). The duality of technology: rethinking the concept of technology in organizations. *Organization Science, 3*(3), 398-427.
- Razmerita, L., Kirchner, K. & Sudzina, F. (2009). Personal knowledge management: the role of Web 2.0 tools for managing knowledge at individual and organizational levels. *Online Information Review, 33*(6), 1021-1039.
- Robinson, S. & Johnson, F. (2012). The process and affective environment of students personal information management. *Enhancing Learning and Teaching in the Social Sciences, 4*(2). Retrieved from http://www.heacademy.ac.uk/assets/documents/resources/publications/Paper040204.pdf (Archived by WebCite® at http://www.webcitation.org/6MRUOvEEO)
- Talja, S. (2010). Jean Lave's practice theory. In G. J. Leckie, L. M. Given & J. Buschman (Eds.), *Critical theory for library and information science exploring the social from across the disciplines* (pp. 205-220). Santa Barbara, CA: Libraries Unlimited.
- Tenopir, C. & King, D. W. (2002). Reading behaviour and electronic journals. *Learned Publishing, 15*(4), 259-265.
- Tenopir, C., King, D.W., Boyce, P., Grayson, M. & Paulson, K.-L. (2005). Relying on electronic journals: reading patterns of astronomers. *JASIST, 56*(8), 786-802.
- Tenopir, C., King, D. W., Edwards, S. & Wu, L. (2009). Electronic journals and changes in scholarly article seeking and reading patterns. *Aslib Proceedings, 61*(1), 5-32.
- Upward, F. (1996). Structuring the records continuum, part one: post-custodial principles and properties. *Archives and Manuscripts, 24*(2), 268-285.
- Upward, F. (1997). Structuring the records continuum, part two: structuration theory and recordkeeping. *Archives and Manuscripts, 25*(1), 10-35.
- Upward, F. (2000). Modelling the continuum as paradigm shift in recordkeeping and archiving processes, and beyond - personal reflection. *Records Management Journal, 10*(3), 115-139.

- Upward, F. & McKemmish, S. (2001). In search of the lost tiger, by way of Sainte-Beuve: re-constructing the possibilities in evidence of me.... *Archives and Manuscripts, 29*(1), 22-43.
- Upward, F. (2005). Records continuum. In S. McKemmish, M. Piggott, B. Reed & F. Upward (Eds.), *Archives: recordkeeping in society* (pp.197-222). Wagga Wagga: Centre for Information Studies, Charles Sturt University.
- von Krogh, G. (2012). How does social software change knowledge management? Toward a strategic research agenda. *The Journal of Strategic Information Systems, 21*(2), 154-164.
- Werbin, K. C. (2012). Auto-biography: on the immanent commodification of personal information. *International Review of Information Ethics, 17*, 46-53.
- Whittaker, S. (2011). Personal information management: from consumption to curation. *ARIST, 45*, 1-42.

How to cite this paper

Huvila, I., Eriksen, J., Häusner, E. & Jansson, I (2014). Continuum thinking and the contexts of personal information management *Information Research*, **19**(1) paper 604. [Available at http://InformationR.net/ir/19-1/paper604.html]

Last updated: 4 March, 2014