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Visualizing information in the records and archives management (RAM) disciplines: Using Engelhardt's graphical framework

Pauline Joseph, Jenna Hartel,

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Visualizing information in the records and archives management (RAM) disciplines

Using Engelhardt's graphical framework

Pauline Joseph
Department of Information Studies, Curtin University, Perth, Australia, and

Jenna Hartel
Faculty of Information, University of Toronto, Toronto, Canada

Abstract

Purpose – This paper aims to explore the concept of information in records and archives management (RAM) from a fresh, visual perspective by using arts-informed methodology and the draw-and-write technique.

Design/methodology/approach – Students and practitioners of RAM in Australia were asked to answer the question, "what is information?" in a drawing and then to describe the drawing in words. This produced a data set of 255 drawings of information or "iSquares", for short. Compositional interpretation and a framework of graphic representations by Engelhardt were applied to determine how participants envision information and what the renderings imply for RAM.

Findings – The images reveal an overwhelming recognition in RAM of the diversity of media formats of information and the hyperconnectivity of information in networked information systems; and illustrate the central place of human beings within these systems. These findings offer striking, accessible illustrations of major concepts in RAM and enable new understandings through the construction of stories.

Practical implications – There are both pedagogical applications and practical implications of this work for students, practitioners and knowledge workers. The graphical representations of information in this research deepen the understanding of textual definitions of information. The data set of iSquares provides opportunities to create new storyboards to explain information definitions, practices and phenomena in RAM disciplines, and, to explain related concepts such as data, information, knowledge and wisdom hierarchy.

Originality/value – This is the first study in RAM disciplines to provide visual illustrations of information using graphical image representations.

Keywords Information management, Records management, Archives management, Draw-and-write technique, Visual arts methodology

Paper type Research Paper

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Aspects of this paper were presented at the: Australian Society of Archivists (ASA) Conference; the Records Information Management Professionals of Australasia Conference (RIMPA) in 2015, 2016 and the International Council of Archives Congress Conference in 2016.

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Introduction

All academic disciplines and associated professions benefit from thoughtful contemplation of their central concepts. In records and archives management (RAM) fields, Upward (1996, 1997) developed the useful concept of a record continuum, a unified strategy for the management of both records and archives. Oliver and Foscarini (2014) added the idea of informatics, arguing that as recordkeeping is a process involving people, it is heavily affected by organizational culture. Numerous technical standards and functional specifications guide the implementation of RAM programs, systems and best practices, but the style and format of theorizing has been rather narrow and homogenous: that is, typically the work uses philosophical analysis to interrogate concepts or the systems analysis paradigm, and in most cases the resulting statements take the form of words.

Yet, words are only one of several forms of thought and communication. We live, work and learn in increasingly dynamic, multimedia environments. There has been a pictorial turn in society to favor images (Mitchell, 2005). On an average more than 250 million photographs are exchanged on Facebook (Kotenko, 2013) and four billion videos are viewed on YouTube, every day (Smith, 2015). The explosion of visual medium suggests that humans possess multiple intelligences (Gardner, 1983) and have a wide-ranging appetite for media that invoke every sense and way of knowing.

Keeping pace with these changes in popular culture, scholars in the social sciences are adopting new methodologies that feature more creative multimedia and multisensory techniques. For example, arts-informed methodology combines the systematic and rigorous qualities of conventional qualitative approaches with the artistic and imaginative features of the arts. Visual research (Prosser and Loxley, 2008) uses images to learn about the social world, and provides an alternative or complement to inquiry based upon words or numbers. Sensory ethnography (Pink, 2009) is based on the understanding that human meaning does not emerge from language alone but from our bodily being in the world.

Information studies, the parent discipline of RAM, are methodologically conservative and have fallen somewhat behind these trends, except for a few recent breakthroughs. For example, in 2011, Hartel launched the first arts-informed, visual study of the concept of information in the field of library and information science. Finding extant definitions of information to be narrowly conceived, formulated exclusively in words, and often inaccessible to students and scholars alike, she sought a commonsense and inspiring visual alternative, exploring how people visualize the concept of information by applying an empirical method known as the draw-and-write technique (Pridmore and Bendelow, 1995). Research subjects are given a piece of white art paper and asked to respond to the question, "What is information?" in the form of a drawing, and then to write a few words about their drawing on the reverse side of the paper. The data-gathering exercise produces a compact piece of visual and textual data called an iSquare.

After analyzing drawings collected from students at a North American iSchool, Hartel reported her findings in publications and conferences of information science (Hartel, 2015, 2014a, 2014b; Hartel and Savolainen, 2016). As instances of arts-informed methodology, iSquare results have been displayed as interactive exhibitions at conferences; and a sample of the corpus is available as an online exhibition at www.iSquares.info. The iSquare drawing technique has also been used in classrooms as a pedagogical strategy to explain the concept of information visually to library students (Hartel, 2014c). Overall, "iSquares bring information science into the visual Information Age and create a richer multimedia genealogy for a beloved central concept" (Hartel, 2017).

Motivated by the iSquare study, the lead author of this paper sought to bring the same arts-informed, visual perspective to the concept of information in the discipline of RAM in a

geographical region, Australia. Joseph felt that in RAM, "information" may be seen by practitioners and students as a central concept in flux, given rapidly changing media formats and information management systems that blur the boundaries between subsets of information like records and archives. It was hypothesized that theoretical contemplation in a visual mode would enrich and enlarge understanding, and inspire all RAM stakeholders to think critically, creatively and deeply about the discipline's fundamentals and future. Three broad research questions underpinned Joseph's project:

RQ1. How is information envisioned in RAM?

RQ2. What do these images reveal about current RAM theory, pedagogy and practice?

RQ2. How can arts-informed, visual methods invigorate all levels of RAM?

In early 2015, Joseph utilized the iSquare protocol to gather 255 drawings of information from 100 RAM students (Australia) and 155 RAM practitioners (Western Australia). Preliminary outcomes have been reported at the Australian Society of Archivists Conference (Joseph and Hartel, 2015b); the inForum Conference for records managers (Joseph and Hartel, 2015a); and the International Council of Archives Congress Conference (Joseph and Hartel, 2016). At these conferences the data set was also displayed as an exhibition.

This paper answers the first research question: How is information envisioned in RAM? The goal is to introduce a new, arts-informed, visual methodology into RAM that stimulates fresh insights into a central concept. To that end, the article describes the methodology, reviews the literature in RAM that defines information, outlines the data gathering and analysis processes and then reports empirical findings. A discussion explores innovative applications of the project, including the production of stories, followed by ideas for future research across larger geographies.

Arts-informed methodology and visual research

Arts-informed methodology combines the systematic and rigorous features of qualitative methodologies with the artistic and imaginative qualities of the arts (Cole and Knowles, 2008). Arts-informed methodology taps artistic practices to generate new insight; it sanctions poetry, literary prose, playwriting, visual arts, dance and music as legitimate methods of discovery, vastly expanding the options researchers have today.

In its use of drawings as data, this study is also an instance of visual methods that rely upon images as evidence, rather than on words or numbers alone (Hartel and Thomson, 2011; Prosser and Loxley, 2008). Weber (2008, pp. 44-45) hence, providing compelling reasons to tap the visual realm:

> Images can make us pay attention to things in a new way [. . .] images can be used to communicate more holistically, incorporating multiple layers, and evoking stories or questions [. . .] and images can be more accessible than most forms of academic discourse.

There are many possible visual research designs. Images can be created by the researcher during data gathering or, as in this study, the research participants can be directed to visually represent their world. Visual data is heterogeneous and may entail photographs, illustrations or cartoons, as well as video and multimedia formats. The academic discipline of RAM and its professional communities can only benefit from these untapped, alternative ways of knowing through the arts and images.

Literature review

A point of departure for a study of visual conceptions of information is the written counterparts. In records and archives management, definitions of what information is

appear in textbooks, standards, and mission statements of cultural institutions and professional associations. There is ongoing debate and challenge in defining this central concept (Yeo, 2007a, 2007b, 2011). The Online Dictionary of Library and Information Science is a useful starting point, defining information as:

> Data presented in readily comprehensible form to which meaning has been attributed within the context of its use. In a more dynamic sense, the message conveyed by the use of a medium of communication or expression. Whether a specific message is informative or not depends in part on the subjective perception of the person receiving it. More concretely, all the facts, conclusions, ideas, and creative works of the human intellect and imagination that have been communicated, formally or informally, in any form (Reitz, 2014).

Reflecting the high quality and broad appeal of its source, this is a sweeping definition that includes the important aspect of context. Other merits of the definition are its inclusion of personal subjectivity and the potential for information to have innumerable formats.

Kennedy and Schauder's (1998) textbook, *Records Management: A Guide to Corporate Record Keeping* primarily deals with paper-based records management in Australian government and private sector organizations. It defines information as "the content of communication" (p. 296). Elsewhere, communication is defined as the processes by which meaning is conveyed among or between people and information storage systems. This definition is not easy to comprehend, as it narrowly links information to communication, which itself is a complex concept.

The RM standard, ISO 15489 Parts 1 and 2: Information and Documentation – Records Management (International Organization for Standardization, 2017; Standards Australia International, 2002), is commonly used by organizations as a benchmark when designing and implementing their RM regime. This important standard neither provides a definition of information nor does it differentiate between information, records, archives and data. In contrast, the AS/NZS ISO 16175.1 standard that benchmarks ISO 15489 defines information as "knowledge communicated or received. The result of processing, gathering, manipulating and organizing data in a way that adds to the knowledge of the receiver" (Standards Australia and Standards New Zealand, 2012, p. 15). The inclusion of complex concepts like "knowledge", "communication" and "data" – without further explanation – complicates this definition of what is information, and renders it incomplete.

The National Archives of Australia also guides RAM professionals with their recordkeeping practices. Drawing upon ISO 14721: Space data and information transfer systems – Open archival information system (OAIS) – reference model, the National Archives defines information as:

> Any type of knowledge that can be exchanged, and this information is always expressed (i.e., represented) by some type of data in an exchange. For example, the information in a hardcopy book is typically expressed by the observable characters (the data) which, when they are combined with a knowledge of the language used (the Knowledge Base), are converted to more meaningful information (International Organization for Standardization, 2012, p. 30).

This definition, like others mentioned earlier, assumes an understanding of the connections between information, knowledge and data. How each of these complex concepts relate to information is not explained, leaving the nature of information mysterious.

Finally, the Society of American Archivists, a professional association for RAM professionals in America, provides a more fulsome definition for information:

> Information and data are near synonyms. Whereas data connotes facts or ideas in their most atomized form, information refers to more complex concepts made up of multiple data elements. Information may take many forms, including words, sounds, images, and formulas.
>
> Information, like data, is independent of any medium in which it is captured as content. Information is intangible until it has been recorded in some medium. Recorded information may be captured in databases, spreadsheets, documents, sound recordings, or motion pictures. Even when captured in a document or other form, the information remains distinct from the medium (Society of American Archivists, 2015).

Usefully, this definition notes the relationship between data and information – that the former is a simplified version of the latter. It also explains how information is independent of its format, a crucial distinction in RAM.

At the moment, conceptions of information in RAM are marked by moments of clarity and precision, as well as much ambiguity. Crucial to this study is the simple observation that all the existing definitions are made of words. Stakeholders in RAM are presently missing an opportunity to approach information visually.

Visual representations of information are important for a number of reasons. Images are meaning-making devices and therefore are valued tools for understanding abstract and complex concepts (Lynn, 2004). Imagery creates memories, which in turn help with remembering and thereby improve communication. Images have the power to cross linguistic boundaries that separate project teams, countries and cultures. Pictorial representations also have a potential for beauty and charm, attributes that are lacking in text definitions and in RAM at large.

Individuals, whether RAM practitioners or users, have different learning modalities or styles: visual; aural; read/write; or kinesthetic (use of experience and practice) (Fleming and Mills, 1992). Visual learners prefer and benefit from pictures, images, paintings, maps, diagrams and flow charts for comprehension (Fleming and Baume, 2007; VARK Team Limited, 2015). Currently, the RAM disciplines have little in the way of research and theory to offer this group of visual learners.

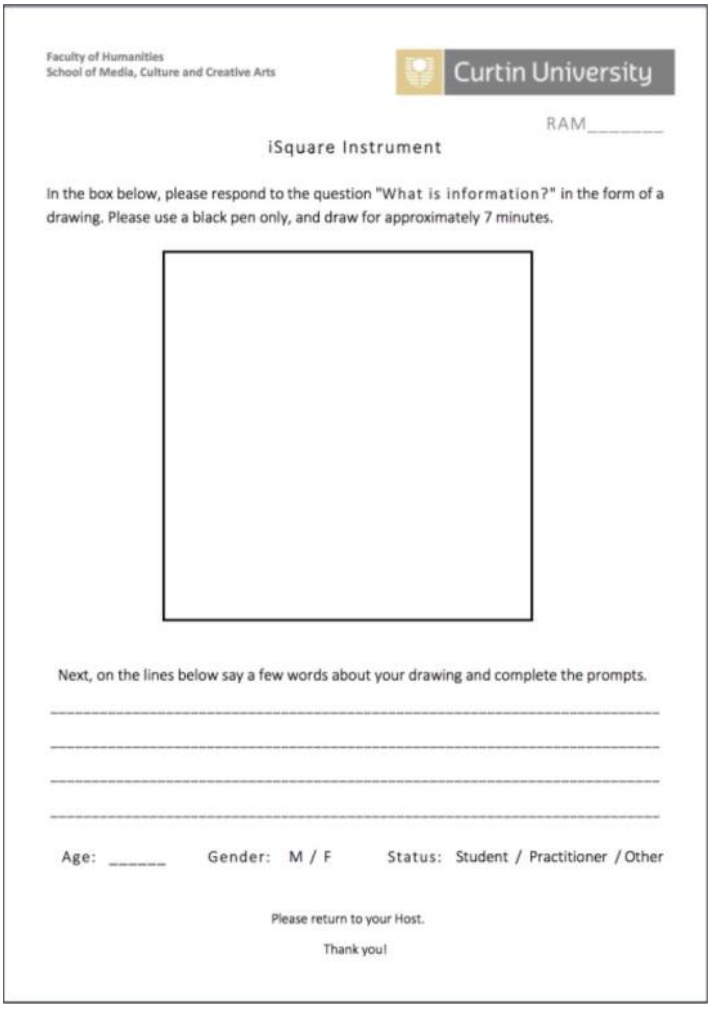
Data collection

The participants in this study were 100 students (Australia) and 155 practitioners (Western Australia) in the field of RAM; they were reached through convenience sampling while attending courses or professional conferences of RAM. Ages ranged from 19 to 73, with the mean age of students 34 and of practitioners 44. There were 184 females and 64 males; seven did not specify their gender.

The data-gathering process was a version of the draw-and-write technique (Pridmore and Bendelow, 1995). Participants were given a RAM iSquare instrument (see Figure 1) with a 4-by-4 inch square space embedded on an A4 page, in which to draw, and a black pen; they were asked to answer the question "what is information?" in the form of a drawing. They were prompted to "Say a few words about your drawing" below their drawing, and to report their gender, age and student/practitioner status. Subjects were given seven minutes to complete the exercise. Respondents were not alerted about the exercise beforehand to generate a spontaneous result.

Data analysis

Following Hartel (2014a), the visual analysis technique of compositional interpretation was applied: that is, "a way of looking very carefully at the content and form of images" ((Gillian, 2012, p. Ch. 4) p. 55). Compositional interpretation is the traditional analytical strategy of art


Faculty of Humanities
School of Media, Culture and Creative Arts

Curtin University

RAM_____

iSquare Instrument

In the box below, please respond to the question "What is information?" in the form of a drawing. Please use a black pen only, and draw for approximately 7 minutes.

Next, on the lines below say a few words about your drawing and complete the prompts.

_____

_____

_____

_____

Age: _____ Gender: M / F Status: Student / Practitioner / Other

Please return to your Host.

Thank you!

Figure 1.
The iSquare data-gathering instrument used for the study

history and art criticism and has most often been applied to paintings. In practice, an expert relies upon "visual connoisseurship" or "the good eye" (Gillian, 2012, p. 49 and 51) to judge images by the conventions of their genre.

The iSquares drawn by RAM students and practitioners were deemed to belong to the genre of graphic representations. Engelhardt (2002, p. 137) has proposed a classification system of ten primary types of graphic representation: map, picture, statistical chart, time chart, link diagram, grouping diagram, table, symbol, composite symbol and written text. In our data set, we had a blank iSquare that was classified as "Other"; hence, we added an 11th classification type to Engelhardt's initial ten.

The research team performed compositional interpretation of the iSquares by analyzing and sorting them using Engelhardt's classification system, and then articulating

associations to existing conceptions of information from the RAM literature. Five of Engelhardt's groups, tables, symbols, text, composite symbols and statistical charts were not common in the data set and are not addressed further.

Analysis for the RAM iSquares occurred at Curtin University's Hub for Immersive Visualisation and eResearch (HIVE), a multimedia research environment (Woods *et al.*, 2015). Digital versions of each drawing were pasted onto Microsoft PowerPoint slides that were then viewed in the "Slide Sorter" mode and projected upon a large, half-cylinder screen, as shown in Plate 1. The authors are shown during the analysis stage, viewing iSquares projected upon the HIVE"s half-cylinder screen.

Findings

Following Engelhardt's classification system, the iSquares from RAM exemplify different types of graphic representations, summarized in Table I; the most common major types are discussed next.

Grouping diagrams

The most frequently occurring graphic representation is what Engelhardt calls a grouping diagram. This is a type of graphic representation that expresses the categorization of a set of elements (Engelhardt, 2002, p. 141). A majority of the grouping diagrams from RAM are illustrated lists of information sources, formats and channels (Figure 2).

It is notable that the largest group of participants in this study (38 per cent) expressed information as a grouping diagram, which emphasizes the reality of multiple formats for information. Drawing information as a grouping diagram echoes the definition of information cited earlier by the Society of American Archivists (2015): "more complex concepts made up of multiple data elements [. . .] of any medium in which it is captured as content". Recognizing that information has many formats also reflects the RAM discipline's accepted wisdom about the heterogeneity of records; indeed, the grouping diagrams handily illustrate the definition of record in the States Records Act in Western Australia in which:

Plate 1.
The researchers conducting data analysis in the Curtin HIVE

> [. . .] any record of information however recorded [. . .] includes:
>
> (a) any thing on which there is writing or Braille;
>
> (b) a map, plan, diagram or graph;
>
> (c) a drawing, pictorial or graphic work, or photograph;
>
> (d) any thing on which there are figures, marks, perforations, or symbols, having a meaning for persons qualified to interpret them;
>
> (e) any thing from which images, sounds or writings can be reproduced with or without the aid of anything else; and
>
> (f) any thing on which information has been stored or recorded, either mechanically, magnetically, or electronically (Government of Western Australia, 2000, pp. Section 3, p.4).

Such grouping diagrams may come quickly to mind for students and practitioners of RAM because of the current rapidly changing formats of information. Advancements in information and communications technologies, including the rise of social media, have led to a proliferation of new formats that blur the boundaries of what constitutes a record or archive. Joseph *et al.* (2012, p. 60) state that the nature of a record has changed; they endorse Yeo's (2011) view that the RAM discipline can no longer perceive records in document formats alone. This message is further reinforced in the revised ISO 15489 standard's principles for managing records that recognizes records in multimedia formats (International Organization for Standardization, 2017, p. 3, Section 4).

Other grouping diagrams entail visual lists of body parts such as the eyes, ears, nose, mouth and hands: in other words, the senses. In a few iSquares the senses appear disconnected and static, whereas others suggest sensory flows through lines as well as

Graphic representation	#	(%)
Grouping diagram	97	38
Link diagram	86	33.7
Picture	63	24.7
Written text	3	1.2
Time chart	3	1.2
Symbol	1	0.4
Map	1	0.4
Other (blank)	1	0.4
Table	0	0
Composite symbol	0	0
Statistical chart	0	0
Total	255	100

Table I. Summary of major types of graphic representation in the data

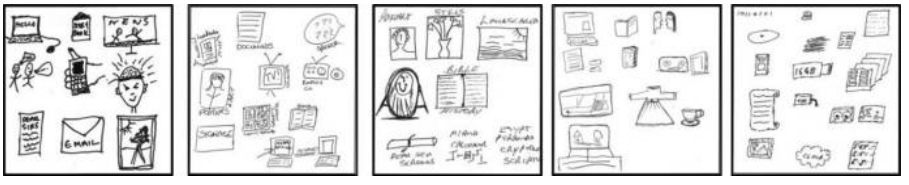


Figure 2. Examples of Grouping diagrams that express information in different formats

inputs and outputs to the sensory system. One notable iSquare (see Figure 3, first left) lists each sense and then an associated record format, a deft integration of the two major themes that appeared in the grouping diagrams: information formats and the senses.

Drawings of information that show the full range of human senses remind us that vision is but one sense among many. Professional practice demands a consideration of the diversity of sensory experience, so that records and archives are accessible to those who rely on senses other than sight. These drawings can also stimulate our imagination as to the kinds of collections that might be possible if all senses are honored equally. This is already well known in the form of audio-visual collections such as music archives. Someday there may be extensive collections of tastes, scents and textures, and the RAM discipline will be charged with entirely new forms of information management.

Link diagrams

A link diagram is one of 10 major types of graphic representation, involving the relation of linking together graphic sub-objects (Engelhardt, 2002, p. 140). The participants in this study often opted for this strategy to illustrate information; there were 86 link diagrams in the data set, 33 per cent of the total. According to Engelhardt, a link diagram features one or more nodes joined by a connector, usually an arrow or line (Engelhardt, 2002, pp. 40-43). There are three noticeable themes among the link diagrams: information flows that are human-centered, linear and networked.

Human-centered

A first theme expressed in the link diagrams, shown in Figure 4, entails a human being as the central node. Arrows representing information flows are directed to and from the figure. It is interesting that in all cases the gender is ambiguous, though the majority of RAM professionals and students in this study are female.

These link diagrams point to human beings as the focal point of information activities in our organizations. As such, they illustrate the paradigm shifts highlighted in Joseph *et al.*'s (2012) recordkeeping responsibilities from traditional RAM practitioners to our organization's users, who are now seen as knowledge workers. Joseph *et al.* (2012) have drawn attention to these paradigm shifts in recordkeeping responsibilities in the twenty-

Figure 3.
Examples of Grouping diagrams that associate information with the human senses

Figure 4.
Examples of iSquares themed human centered information flow

first century, and highlight the need for RAM professionals to simplify practices so that end users can perform recordkeeping roles. It is uplifting to report that in many iSquares in this study, people are smiling, suggesting the paradigm shift may be positive for those involved.

Linear

This second theme appearing in the link diagrams is shown in Figure 5. In these iSquares, arrows depict linear flows, pointing from one stage of a sequential information process to the next. These renderings may capture the traditional controlled operations of a records center and illustrate aspects of the record continuum model's process of create, receive, capture, organize, use and share (Upward, 1996, 1997). Compared with other more chaotic networked information environments (Figure 6), these iSquares reflect well-ordered and perhaps overly simplified and idealized information processes.

Network

A final theme appearing in the link diagrams, shown in Figure 6, displays information as a network, that is, a group or a system of interconnected people, technology or things. These networks reflect a number of realities associated with RAM: the hyperconnectivity of the information infrastructure; the absence of any apparent headquarters or center; the superabundance of actors; a sense of ubiquity and overload; and the irrelevance of geography. This set of iSquares suggests the complex, dynamic, even chaotic information environments of any information-based organization or community today.

Pictures

The third of Englehardt's types into which the iSquares were categorized is pictures, which formed 23.7 per cent of the data set. A picture is "a graphic representation that serves to represent the physical structure of physical objects" (Engelhardt, 2002, p. 139). We observed five distinct themes for the pictures: container, individual in an information environment, the earth, light bulb, and nature.

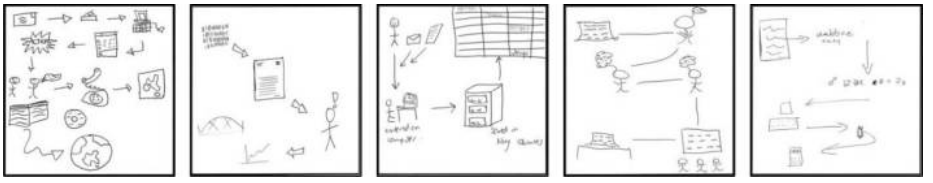


Figure 5.
Examples of Link diagrams depicting linear information flow

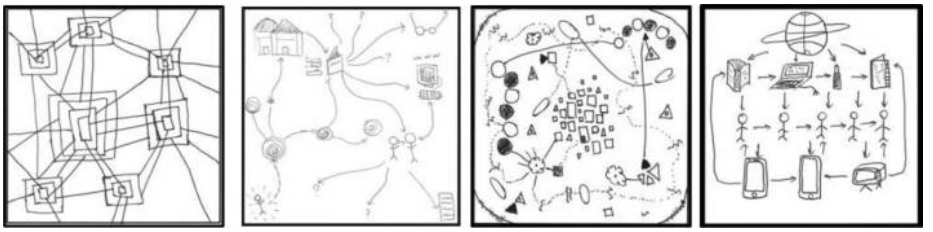


Figure 6.
Examples of Link diagrams showing the networked information environment

Container

Many drawings expressed information in the form of a container, that is, some kind of medium for storing, transmitting or archiving information. The container may be a print artifact such as a document, book or map, as shown in Figure 7. The box is a container well known in the RAM profession for housing corporate files for archiving or storage onsite or at an offsite commercial facility.

Another type of container is any form of information technology, such as a handheld device or a computer, shown in Figure 8; these are perhaps the most familiar containers nowadays for information.

Containers give information its shape and structure, thereby making it tangible and accessible. Metadata is extensively used to describe information in containers that can be easily searched, accessed and retrieved by users. Obviously, the type of container affects how the RAM profession manages records and archives because different RAM practices are required to manage one type or another; for example, information stored in electronic containers requires greater consideration of security permissions and digital rights management in terms of read, write, view, delete and access permissions.

Individual in an information environment

Several pictures in our data set show an individual in an information environment, as displayed in Figure 9. Some of the images are quite expressive and charming. Like the link diagrams in Figure 4, these iSquares are reminders of the centrality of human beings in the information age and in RAM enterprises. People who are knowledge workers in an

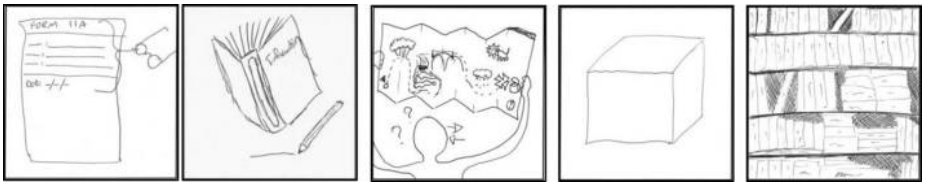


Figure 7.
Examples of Pictures of paper-based containers of information

Figure 8.
Examples of Information technology as containers for information

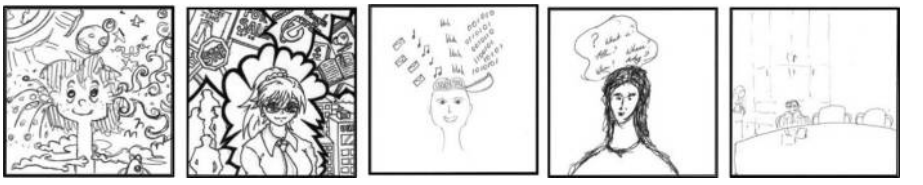


Figure 9.
Examples of Pictures that are an individual in an information environment

organization are the creators, receivers and recordkeepers of information. People are held accountable for the records they create, receive and use as private citizens and as government employees. Various regulations such as the Crimes Act 1958 (Parliament of Victoria, 1958) and the State Records Act 2000 (Government of Western Australia, 2000) impose recordkeeping responsibilities on people (employees and citizens) and enforce penalties ($10,000 fines) for non-compliance.

Records and archives at a personal level are known as person-related records that "supply official and legally valid information about life events, marital status, ancestry, offspring, residency, religious affiliation, employment, property, as well as other vital details" (Namhila, 2016, p. 113). Various community, state and national public record offices and archives create, collect, house, preserve and provide access to information that tells about the history and culture of its people and community. Examples of these archival records are immigration records, registers of births, deaths and marriages, and baptism and confirmation records. Researching and tracing family history and ancestors is a popular leisure activity (Yakel, 2004) that is facilitated by such records. As the core business activities of government agencies are to deal with people, they document the legal status and rights of its citizens from birth to death.

The Earth

Seven of the iSquares contained an image of the Earth (Figure 10). These drawings reflect global and multicultural realities of the Information Age, which have repercussions for RAM practice. When seen from a global perspective, RAM entails working with standards and protocols for sharing information across geographies, as well as hardware like satellites that make communication over vast distances possible. Globally, there are strategies to transit from paper to digital recordkeeping paradigms, with policies to manage born digital information electronically henceforth (National Archives of Australia, 2014). The trend toward managing information through cloud computing can be seen as a response to the need to transcend the vast geographies reflected in these iSquares.

Light bulb

Another recurring theme within the pictures was a lightbulb (Figure 11). In cartoons, a light bulb is an "upfix" (Cohn, 2013) that appears over the head of a character with an idea, a reference to Thomas Edison's breakthrough refinement of the device. This pictorial metaphor implicates information in creativity and discovery. Pictures of information as a light bulb are also reminders of the knowledge kept in the mind. RAM disciplines emphasize the need to convert this knowledge into tangible records and archives so that corporate or community memory is captured and shared beyond any singular individual.

Figure 10.
Examples of Pictures of the Earth

Nature

In a refreshing change of perspective, some iSquares invoke nature. Figure 12 shows renderings of trees, an iceberg and a dinosaur. Since it is unlikely these are meant to express information literally, they can be seen as pictorial metaphors (Forceville, 2008). Although only a few participants used nature as a source of inspiration, it creates an opportunity to reflect upon the relationship between nature and RAM. The trunks of trees exhibit rings that are records of growth, weather and pollution, among other forces; and core samples of icebergs and glaciers have likewise been used to construct geological history of tens of thousands of years. One of the most amazing records of life on earth exists in the form of fossils, which prove the existence of the dinosaur shown in the last drawing in Figure 12. It is awe-inspiring and humbling to recall that nature is the most awesome RAM enterprise of all.

Time charts

Engelhardt (2002, p. 140) describes a time chart as "a graphical representation in which the syntactic structure serves to show the passing of time". Three time charts appeared in the RAM data set (see Figure 18); each contains a horizontal axis that is a timeline. The drawings suggest, respectively, the unfolding of major historical events, weather patterns and a genealogy.

Time is an important component in the RAM discipline, as records and archives document the history of persons, communities, places or events over a period of time. Archives are historical records of our past, and the evidentiary characteristic of a record requires it to be time-stamped for proof of what happened when, how and by whom (Figure 13).

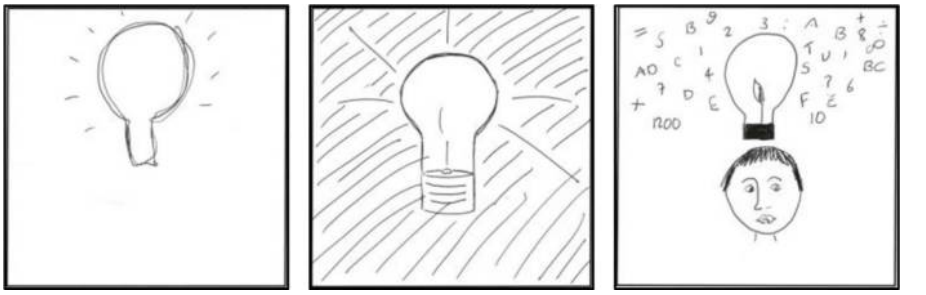


Figure 11.
Examples of Pictures depicting a Light bulb

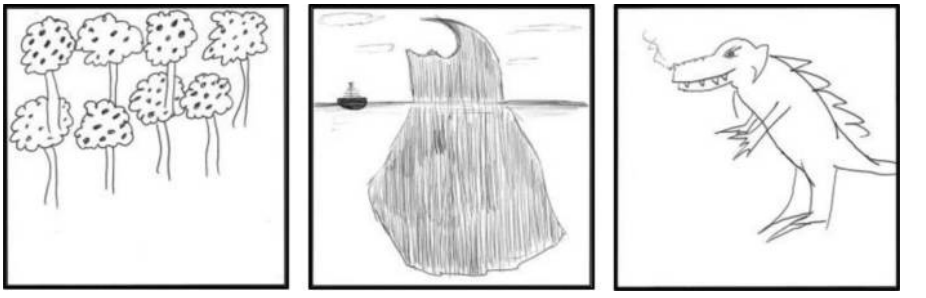


Figure 12.
Examples of Pictures that invoke Nature

Engelhardt's framework of graphic representation includes tables, symbols, text, composite symbols, and statistical charts. These forms were not common in the data set and therefore are not addressed further.

Discussion

This visual data set indicated that individual iSquares may be the building blocks of illustrated stories that help define information and explain how humans engage with information in the RAM disciplines, as the following three storyboards exemplify.

Story 1 – relating information, data, records and archives

In the definitions reviewed earlier in the paper, the relationships between information-related concepts were often found to be ambiguous. These iSquares provide a means to clarify these relationships visually. The stories begin with the iSquare at left and progress toward the right (Figure 14).

> Story 1: "Data exists as abstract bits that need to be filtered for sense making [1]. Our brain receives data and processes it into information [2] placing information into context generates tacit knowledge [3]. Tacit knowledge can be contained as recorded knowledge [4]; by recording it in different media formats and forms we create another subset of information referred as records and archives [5]".

Story 2 – illustrates the definition of information by the information and records management society (IRMS)

In Story 2, graphic representations from the data set illustrate the definition of information by the Information and Records Management Society (2011, p. 2). Adding these visual illustrations aids comprehension of this definition for students, practitioners and knowledge workers (Figure 15, 16 and 17).

> Story 2a: "Information and records management is, in a nutshell, all about an organization's control [1] and utilization of its information assets [2 and 3]".
>
> Story 2b: "These in turn are defined as all the various records and information resources held by an organization. Information assets comprise all written records [4] as well as data [5], images, sound recordings [6] and information held in other formats [7].
>
> Story 2c: "They include information held on paper [8 & 9], electronic and other media [10] as well as staff knowledge relating to their employment within the organization [11]".

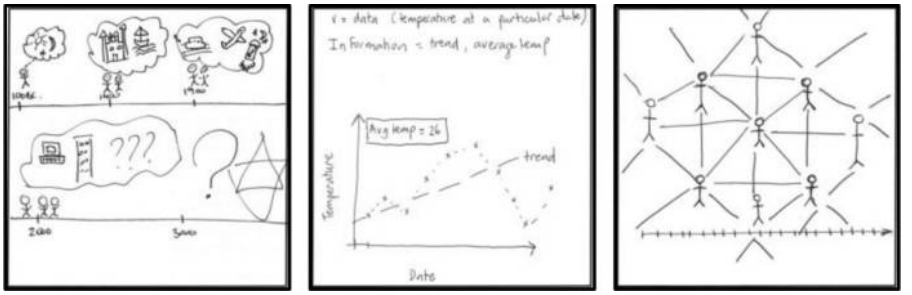


Figure 13.
Example of iSquares depicting Time charts

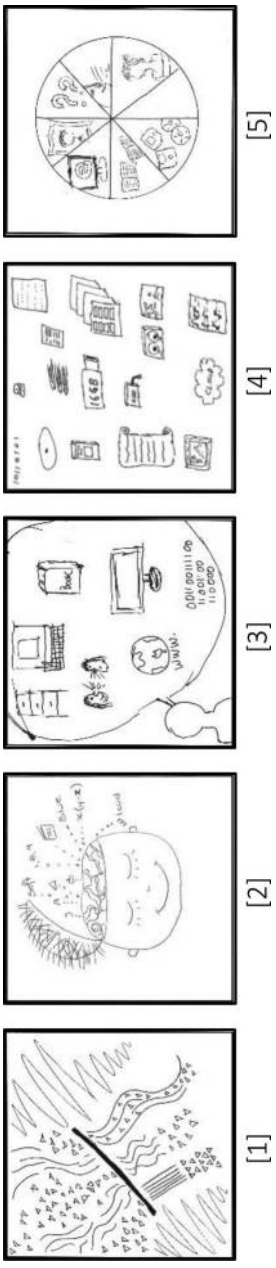


Figure 14.
Story 1

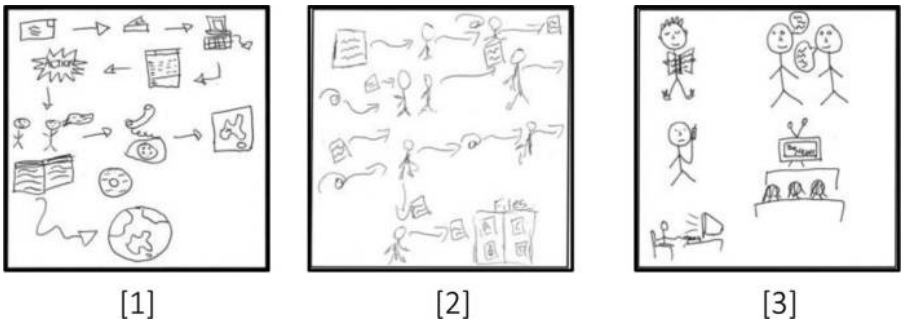


Figure 15.
Story 2a

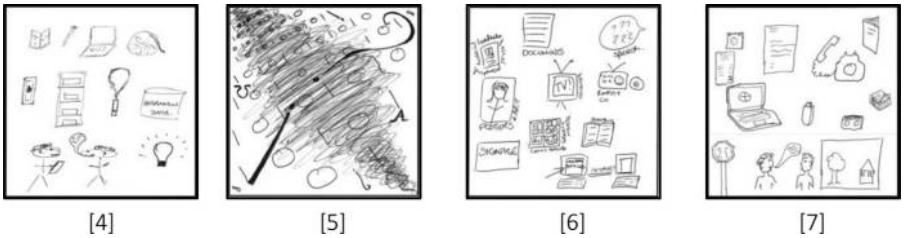


Figure 16.
Story 2b

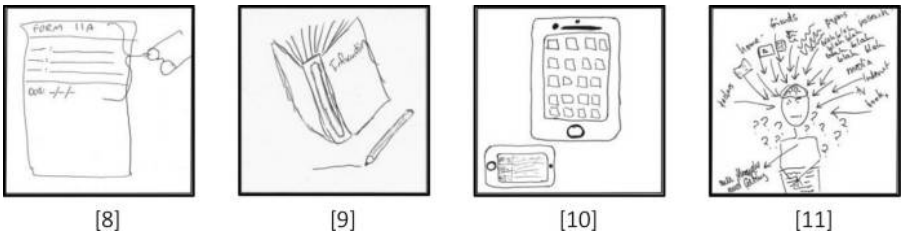


Figure 17.
Story 2c

Story 3 – information at an organizational level

Story 3 illustrates how information, records and archives in the organizational context is received, created, captured, shared, managed and preserved in Figure 18.

> Story 3: "Our organizations are usually connected with various stakeholders and we receive information from these external contacts [1]. Paper-based information is received centrally by our records management centers and is managed using our records management programs. Paper-based

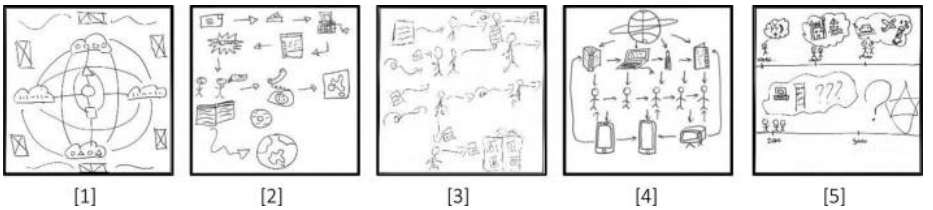


Figure 18.
Story 3

> information is digitized, registered into our corporate electronic document and records management systems (EDRMS), and routed to action officers for them to proceed with their work tasks [2]. Our users collaborate internally with their colleagues on the information they both create and receive [3]. Users also engage in collaborative information activities with stakeholders of the organization by transmitting information to them and sharing it [4]. Finally, as some of these records will have continuing memory value, they will therefore be classified as records of archival value that need to be retained to preserve the organization's corporate memory and history [5]".

When students and practitioners were asked to draw "what is information?", their drawings revealed a perception and understanding that information:

- is everywhere in the world we live in (Figure 10 depicting pictures of the globe) including in nature (Figure 12).
- evolves with time (Figure 13).
- uses our human senses as the key channels for both consumption and sense-making and importantly communication of the information we come in contact with others (Figures 3, 4, 9, 11 and 12).
- involves people (Figures 4 and 9).
- has multiple elements of data, knowledge, wisdom, records and archives at its various stages or in the information lifecycle (Figure 14).
- is a process of activities that requires human input, and in some cases technology, to create, receive, filter, sort, organize, share and use (Figures 4 and 5).
- has many varied containers or media formats (Figures 2, 7 and 8).
- in digital format is linked, thereby enabling hyperconnectivity, a state where everything is talking or communicating: person to person, person to machine (Quan-Hasse and Wellman, 2006) (Figure 6).

The drawings in this data set reveal that information has an omnipresent aura, as it is everywhere. Humans connect with information they interact with via their senses. Each of us makes sense and meaning based on our understanding of the context surrounding the information we come in contact with. We then act with the information received, selecting and sorting what is required, organizing it to make sense to us, sharing it, collaborating with others and creating new information, which we share with others as required.

The human life is one metaphor that can be used to describe information. Information is like people: it is born (created/received), lives (is used/shared), dies (is destroyed) and reincarnates (is reused/reborn) with new identities (new content and media formats).

Pedagogy and practice

The RAM iSquares can be used to create other storyboards to assist students, practitioners and knowledge workers to understand the nature of information. It also promotes conversations about information practices in their organizations. There are several pedagogical applications and RAM practice implications that can be derived from this study.

Novel pedagogical applications

The findings of this study offer pedagogical applications, especially for students, that are also applicable to RAM professionals and knowledge workers.

The visual illustrations assist RAM students and professionals to understand the concept of information better. They help explain the difference between related concepts:

data, information, knowledge and wisdom hierarchy, and clarify how records and archives fit and differ in this hierarchy. It complements textual definitions of information with "visual representations to better determine if learning has taken place" (Lynn, 2004, p. 422), and consequently caters for learning using the different sensory modalities of the RAM discipline (Fleming and Baume, 2007; VARK Team Limited, 2015). This is especially useful for visual learners, who may find that the combination of images and words helps them to understand what are at times abstract and complex concepts.

The varying media formats that information takes influence how RAM programs are implemented to manage, access and preserve information assets in organizations. The data set reveals the prevalence of information in electronic media formats; this flags a need for technology-savvy skill sets in RAM practitioners and graduates joining the profession.

RAM practice implications

The pedagogical applications can be applied by practitioners in their RAM literacy programs when inducting knowledge workers into organizational RAM programs, systems and practices. Like students and practitioners, knowledge workers may be unfamiliar with distinctions between data, records, archives, knowledge and wisdom; providing visual illustrations to explain the differences will assist their comprehension of each concept and its interconnection with the others. The storyboards may be helpful in improving their RAM literacy skills.

The grouping and link diagrams may provide practitioners with an improved visual appreciation of the exponential growth of information in different media formats that they are faced with; they may provide them with insight into how their knowledge workers are being overwhelmed with information coming at them from different sources and media formats.

More importantly, it is hoped that the visual representations, which group and link information contained in multimedia formats and emphasize its hyperconnectivity, bring attention to the blurring boundaries of digital information. The transition to digital information management stresses the need for archivists and records managers to work together to identify records of archival value early in their information life cycle and take steps to ensure their long-term preservation.

Finally, these visual representations of information pinpoint professional challenges in managing "big data", ensuring it is available as "open data" where required and does not become "dark data". This signals the need to continue professional development in the RAM disciplines so that practitioners have the skills to manage information as it grows in volume and as its containers – its media formats – vary.

Methodological issues and limitations

Four methodological issues and limitations are noted here. First, the compositional analysis focused on the drawings, not the text descriptions captured below the drawings following analysis strategies applied to paintings (Hartel, 2014a, 2014b, 2014c). This approach means that the interpretations are subjective and favor visual, not textual, expression; a content analysis of the text responses is likely to enhance the findings. Second, sometimes it is difficult to classify an iSquare into a single type of graphic representation: for example, when an iSquare offers features of both a grouping and a link diagram, researchers must decide which is more dominant and appropriate. Engelhardt's framework is not an ideal analytical device unless compromises and hybrid types are allowed. An example of a hybrid of grouping and link diagrams is presented via the last to images in Figure 3. Third, sometimes participants commented, "I'm not good in drawing" or "I can't draw", and it may

be that the meaning derived from some iSquares is constrained by the participant's drawing ability and are skewed toward simple graphic objects that are easy to draw. Fourth, the findings cannot be generalized globally across the RAM disciplines, as the participants are restricted to practitioners in Western Australia, and students were from one academic institution in Australia but from the different Australian states.

Conclusion and future research

This paper offers the first arts-informed visual study of information within RAM. Hopefully it will not be the last, as there is much more to be learned. Visual conceptions of information in the RAM disciplines may differ with geographies, disciplines and population groups, so a future step is a comparative international study of RAM students and professionals. Educators and students internationally are welcome to contact Joseph to be part of this next phase of the research initiative. An interdisciplinary study at Joseph's University is underway to explore whether disciplinary cultures influence visual conceptions of information. As the project discussed here focuses on RAM students and practitioners and not on users of RAM systems, future research to collect iSquares from knowledge workers in a variety of private and public sectors is also indicated. If you would like to participate in any of these planned future research projects, please email Joseph to corroborate.

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About the authors

Pauline Joseph (PhD) is a Lecturer in Records and Archives Management at the Department of Information Studies at Curtin University. Pauline studies how information is perceived and used in organizations and communities. With this focus in mind, she completed her PhD at the University of Western Australia in 2011, studying how knowledge workers search for corporate information in electronic document and records management systems (EDRMS). Her PhD research is titled "EDRMS search behaviour: implications for records management practices". Pauline's current research interest is about understanding the concept of 'information' using the draw-and-write research technique and visual arts methodology in the records and archives management (RAM) disciplines. Pauline also conducts research on the sustainability of community-based information management practices. She uses the motor sport community as a case study to investigate sustainable information management practices. Pauline Joseph is the corresponding author and can be contacted at: p.joseph@curtin.edu.au

Jenna Hartel (PhD) is an Associate Professor at the Faculty of Information, University of Toronto. She received a Doctorate of Philosophy in Information Studies from the Department of Information Studies at the University of California, Los Angeles (2007). Her research is organized around the question: What is the nature of information in the pleasures of life? She is investigating this matter through the concatenated study of information phenomena in serious leisure – cherished, information-rich pursuits such as hobbies. Her empirical research explores the content, structure, and use of leisure information on personal and social levels, and her theoretical work aims to characterize the nature of information in leisure realms. She has published on these topics in *JASIS&T*, *Journal of Documentation*, *Knowledge Organization* and *Information Research*. Dr. Hartel is an early adopter and champion of visual research methods, and she is the creator of the iSquare Research Program.