Electronic records management – a state of the art review

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Abstract

Purpose – This paper aims to examine the state of the art in electronic records management (ERM) with the goal of identifying the prevailing research topics, gaps and issues in the field.

Design/methodology/approach – First, a wide search was performed on academic research databases, limited to the period between 2008–2018. Second, the search results were reviewed for relevance and duplicates. Finally, the study sources were checked against the list of journals and conferences ranked by computing research and education and JourQual. The final sample of 55 selected studies was analyzed in depth.

Findings – ERM has lost some research momentum due to being deeply embedded in affiliate information systems areas and the changing records management landscape. Additionally, the requirement models specified by Governmental/National Archives might have constrained technology innovation in ERM. A lack of application was identified for the social media research area.

Research limitations/implications – Limitations were encountered in available search tool functionality and keyword confusion leading to inflated search results. While effort has been made to obtain optimal search results, some relevant articles may have been omitted.

Originality/value – The last ERM state-of-the-art review was in 1997. A lot has changed since then. This paper will help researchers understand the current state of ERM research, its understudied areas and identify gaps for future studies.

Keywords Electronic records management, ERM, State of the art review

Paper type Literature review

Introduction

The electronic record has been extensively contrasted and compared with the traditional physical record by various authors in terms of appraisal, custody, storage, disposition and other features (Erlandsson, 1997). Electronic records management (ERM) as a sub-discipline of records management was formulated in response to the observed differences. The apportioned emphasis should have accelerated ERM as a field of study, however, the recent ISO Records Management Concepts and Principles document (ISO 15489–1, 2016) has normalized the term "record" to include both electronic and physical records. Does the reduced reference to the electronic record mean that the well-documented differences are now reconciled and resolved? Additionally, the absorption of ERM in the broader fields of Enterprise Content Management (ECM) and Enterprise Information Management (Zykov, 2006) has blurred the visibility of ERM. Does ERM still exist as a viable field of study?

Erlandsson (1997) provided the *most recent* comprehensive global ERM literature review. Although other authors have performed recent national, regional or sectional ERM literature reviews, for example, Eastern and Southern Africa region – Chigariro and Khumalo (2018), Ghana – Mensah and Adams (2014) and Korea – Lee and Lee (2009), these do not portray the state of ERM research and practice in general.

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A new globally focused state-of-the-art literature review in ERM will help researchers understand the current state of the practice, its understudied areas and identify research gaps for future studies. The goal of this paper is to provide a current, comprehensive, global state-of-the-art review of academic research in ERM, specifically between the years 2008 and 2018.

The rest of the paper is organized as follows. Section 2 discusses the methodology used for the literature gathering, including database searches and metrics analysis. Section 3 is a categorized review of the articles discovered in the search. Section 4 summarizes the literature review and draws conclusions.

Methodology

The approach used in our literature search primarily follows the method used in the literature review work of Alalwan and Weistroffer (2012) on ECM, which is a comparable and similar subject matter to ERM. The approach is of three-folds:

(1) First, a wide search was performed on university library resources, Journal Storage, DeepDyve and Google Scholar. The search keywords used are, namely, "ERM," "electronic document records management system (EDRMS)," "ECM," "enterprise information management (EIM)," "knowledge management (KM)," "DoD 5015.2," "management of electronic records (MoReq)," "retention," "schedule" and "record classification." To ensure the search results were only ERM relevant, some keywords such as "medical," "transport" and "task" were excluded from the search criteria. Additionally, the search was limited to the past 10 years – between 2008 and 2018. This phase produced 4,523 search results.

(2) In the second phase, the obtained search results were filtered for relevance and duplication, resulting in a shortlist of 95 articles.

(3) The *final* step was a source quality proof by checking the article sources against the list of ranked journals and conferences, as recommended by Brocke *et al.* (2009). For this phase, only articles published by journals and conferences ranked A, B or C by computing research and education or JourQual were included. This reduced our final list to *55 articles*.

To ensure that all ERM-related articles were included, we broadened the literature search to include articles under ECM and EIM where the word "record" is mentioned. In addition, where these articles are found relevant to ERM, the subject matter discussed is included and considered equivalent to ERM in principle.

The articles were organized into four major categories of concepts, challenges, case studies and technologies, based on our analysis of the researched topics. Additionally, we devised a total of 15 sub-categories as shown in Table 1, which form the structure of the literature review section.

Literature review

This section reports the findings of the reviewed literature, starting with the descriptive statistics on the number of papers published in the different studied domains, years and publication venues. The articles were then reviewed and classified into the four main categories identified in Table 1.

Of the final 55 short-listed articles:

- In total, 40 were published in A-ranked, 5 in B-ranked and 10 in C ranked journals and conferences.

Table 1.
Article distribution by research category

Category	Sub-category/article references	No. of articles
Concepts		14
	– Archival theory: Cook (2011), Cunningham (2008), Niu (2012), Upward *et al.* (2013), Xie (2011), Yeo (2008)	6
	– Business process: Brocke (2011), Cunningham (2011), Evans *et al.* (2014)	3
	– Record classification: Asma-Mokhtar and Yusof (2015), Henttonen and Kettunen (2011)	2
	– Retention schedule: Arias (2008), Lu *et al.* (2013), Man (2010)	3
Challenges		9
	– People and information culture: Lian (2015), McLeod and Childs (2013), Sundqvist and Svärd (2016),	3
	– Long-term preservation: Fritzke (2008), Gladney (2009), Lemieux (2016), Svärd (2013), Yakel *et al.* (2013)	5
	– Social media: Xie (2016)	1
Case studies		19
	– Implementation planning: Akussah and Asamoah (2015), Chigariro and Khumalo (2018), Dawes (2008), Gunnlaugsdottir (2008), Hase and Galt (2011), Haug (2012), Henriksen and Andersen (2008), Jaakonmäki *et al.* (2018), Katuu (2016), Külcü and Çakmak (2010), Mensah and Adams (2014), Mukred *et al.* (2018), Popoola (2009), Wilkins *et al.* (2009), Gunnlaugsdottir (2009), Hu *et al.* (2010)	16
	– Email management: Lappin *et al.* (2018), Park and Zwarich (2008)	2
	– Open source: Maican *et al.* (2016)	1
Technologies		13
	– Model specification: Thurston and Sataslaatten (2014), Henttonen (2009), Joseph (2008), Swartz (2008), Vieira *et al.* (2012), Wilhelm (2009), Lappin (2010)	7
	– Big data: Johnson *et al.* (2014), McDonald (2014), Serewicz (2010)	3
	– Automatic document classification: Lutz *et al.* (2013), Makhlouf (2015)	2
	– Content services: Goldschmidt *et al.* (2012)	1
Total		55

- In total, 8 are from the ECM, EIM and KM domains, the remaining 47 are firmly from the ERM domain.

The top publisher is the *Records Management Journal* with 31 articles. "The American Archivist" is the second with six articles. The *International Journal of Information Management* and *Journal of Enterprise Information Management* journals, with five and two articles, respectively, are mainly focused on ECM and EIM. The rest of the publishers have one article each.

The article distribution by research category (Table 1) indicates that the most research efforts were placed in ERM strategy, followed by processes, tools and people in this order. Furthermore, 2008 was the year with the highest volume of publications (10 articles), while 2018, 2015 and 2012 are tied for the least articles with 4 each. Overall, one could say ERM publications trended downwards after 2008 (Table 2).

Concepts

Concepts are the theories, processes and thoughts that define the ERM practice. In this category, we reviewed 14 articles.

Archival theory

Archival theory is the body of theory that deals with the practice of appraisal, authentication, preservation and access control of records (Pearce-Moses, 2005). One of the articles in our collection that dealt with archival theory was Yeo (2008). The paper focused on the need to acknowledge the "fuzzy boundary" between prototypical records and record-like objects. The nature of the record was described as diverse and multifaceted. The article concluded that while records generally provide affordances of evidence and information related to activities, they do so because they are persistent representations of occurrences, which are not delimited by a hardline-boundary. The central theme in the article is the need for cross-boundary sharing of records with other communities of practice.

Two articles on our list covered theories related to digital archiving (Cunningham, 2008; Xie, 2011). Cunningham (2008) argued that digital archives is fundamentally different than digital curation, with the later more relevant to libraries and museums. Additionally, the open archival information system, which has become a standard for digital curation and libraries, is observed as being delinquent in addressing the core digital archives requirement of "at creation" identification of records among the volume of potential records.

The foundations for a new field of study called Digital Records Forensics was proposed by Xie (2011). The paper used a comparative study method and discovered that while the Digital Records Management community was strong in the understanding of the theories and concepts

Table 2. Article distribution by publication year

Year	Count
2008	10
2009	6
2011	6
2013	6
2010	5
2014	5
2016	5
2012	4
2015	4
2018	4

of records management, the practice lacked the technical savvy persona of Digital Forensics. Digital Records Forensics represents a "best-of-both-worlds" amalgamation.

The appraisal and custodial organization of records remain a challenge for archivists as they transition from physical records management to ERM (Niu, 2012; Upward *et al.*, 2013). Comparing the appraisal and custody methods used by four national archives, namely, National Archives and Records Administration (USA), National Archives of Australia (NAA) (Australia), National Archives (UK) and Library and Archives Canada (Canada), Niu (2012) found that the archives use similar methods of macro and micro appraisal for both paper and electronic records. Although Australia used a post-custodial approach in the 1990s, where the electronic records remained with the originating agency, the decision was reversed in the year 2000 in favor of NAA custody. The predominant custody method is "traditional custodial," with the post-custody model considered acceptable under special circumstances. Authentication and preservation feasibility of electronic records, however, remain a challenge for all the national archives (TNA).

Acknowledging the complex issues of information chaos, Upward *et al.* (2013), proposed that new appraisal thinking, systems and organizational processes can better handle electronic records. Using the record continuum and record-keeping metadata as two key building blocks, the paper proposed Recordkeeping Informatics as a possible solution.

The age-old archivist-historian professional relationship was explored by Cook (2011). The paper argues for better collaboration between the two professions to produce a deeper understanding of the history behind records.

Process

Process is a collection of related tasks performed in a specific sequence to produce a product or service (Rosing *et al.*, 2014). Cunningham (2011) argues that the imbalance of the current records systems and business processes is the reason for the failure of several ERM implementations. The paper recommends the ICA-Req Module 3 – guidelines and functional requirements for records in business systems – approach as a tenable future resolution for the harmonization of ERM business process and system implementation.

From another perspective, Vom Brocke (2011) explored the business process associated with content management using a literature review and two case studies. They found that content lifecycle can be modeled into seven phases, namely, create (digital), capture (paper), edit, review, store, retrieve, retain, which could be used to bridge ECM research and practice.

Using a collaborative action methodology, Evans *et al.* (2014) found that a set of policy and process frameworks was able to improve the management of complex legacy data. The Wind Tunnel legacy data project of the Australia Defence Science Technology Organisation Flight System Branch was used as an example.

Record classification

Record classification entails the organization of records into categories by using controlled vocabulary, code and access restriction to identify, distinguish and relate the records (Pearce-Moses, 2005). The relationship between function-based record classification and the pattern of organizational use of electronic records management system (ERMS) in a Finnish governmental agency was studied by Henttonen and Kettunen (2011). Analyzing the captured usage of metadata in the ERMS against the organizational structure, the paper concluded that function-based record classification is largely delimited along organizational lines.

Despite the well-established importance of records classification, Asma-Mokhtar and Yusof (2015) argued that the concept still lacked the clarity it requires. Comparing against classification in library science, where classification is universally agreed and applied, classification in archives and records management is either understudied or a victim of abandoned expert debate.

Retention schedule

Retention schedule is a documented instruction that identifies and describes the disposition of records throughout the specified life cycle (Pearce-Moses, 2005). Functional appraisal and surveying techniques can be used as methods of creating organizational and legal requirements for record retention schedules (Man, 2010). The same techniques were, however, found to be less effective for dealing with legacy records.

Using a Delphi Study methodology, Arias (2008) appraised the statistical records of the European Central Bank for retention scheduling purposes. The study found that early end-user feedback and facilitated consensus on the value and subsequent retention periods of records can result in a successful implementation of the records schedule.

The challenge of providing database auditability under retention policies was tackled by Lu *et al.* (2013). Typical retention policies enforce data purge that makes auditing database incomplete. Two solutions were proposed, namely, a tuple-independent model with strength in performance and a tuple-correlated model with strength in accuracy, but weakness in the reverse.

Challenges

Challenges are the problems that are difficult to solve in ERM. People/information culture, long-term preservation and social media are the three challenges discussed in this category.

People and information culture

Information culture addresses the norms, attitudes and ways by which organizations and people value information (Sundqvist and Svärd, 2016). Three articles in our collection acknowledge that people and information culture predominate as a fundamental challenge facing ERM implementations.

McLeod and Childs (2013) conducted an empirical research into ERM implementation issues with 200 participants. The study identified 446 issues and over 1,000 suggested solutions. The research analysis indicated that the success or failure of ERM solutions can be dependent on the presence or absence of small or accidental factors. The authors recommended against the use of best or good practices in the handling of complex people issues such as attitudes and perceptions. For these, they recommend experimentation and "good-instinct" solutions, founded in good leadership and collaboration with all the stakeholders.

The cultural dimensions theory was used by Lian (2015) to study why the implementation of Chinese archives microblogging was not successful, despite its popularity. According to their findings, the prevailing culture at the Chinese archives is one of centralized power, closed, risk-averse and high level of uncertainty-avoidance, which led to low participation in the microblogging project.

Despite the investments in technology, legal and business frameworks and systems, Sundqvist and Svärd (2016) discerned that organizations still struggle with the implementation of good information and records management practices. While a clear definition of information culture remained elusive in the paper, they concluded that good information culture, irrespective of the organizational type, promotes information sharing and collaboration, which improves performance.

Long-term preservation

Long-term preservation is the ability to guarantee access to records for long periods of time (Factor *et al.*, 2009). Over time, technologies (including formats, hardware and software) and technical communities are likely to change adversely impacting the ability to use the records unless a long-term preservation strategy is in place.

The role of good recordkeeping of provenance, authenticity, long-term preservation and supporting documentation in the value of artworks was examined by Fritzke (2008). The study results show that long-term recordkeeping increased artwork value. Furthermore, the issue of long-term preservation of digital archives was critically examined by Gladney (2009) in terms of archival principles, business process and technical feasibility. A trustworthy digital object (TDO) architecture was proposed as a solution to the challenge. The main components of the TDO architecture include cryptographic message and signature authentication to ensure integrity, eXtensible markup language-packaged metadata with registered schemas and computing platform-independent bit-string encoding for long-term intelligibility.

Seeking to extend the models, Yakel *et al.* (2013) questioned the quality of the audit process by comparing the criteria in the International Standards Organization's Transfer Systems – Audit and Certification (ISO TRAC) with interview responses of 66 users, comprising of archaeologists and social scientists. ISO TRAC 16363:2012 of trustworthy digital repositories are commonly used to validate the services of long-term digital preservation providers. The research found the user communities associated trust with technology services, repository's transparency, guarantees of preservation and institutional reputation. However, they advised for more research to generate metrics on the softer criteria of trust in repositories.

Svärd (2013) proposed the use of ECM and records continuum model (RCM) frameworks to mitigate the challenge of long-term preservation of records. The study found that the pluralization phase of RCM lends itself to the re-use of information, which combined with the ECM tenets of collaboration and system integration can mitigate the challenge of long-term preservation.

Finally, Lemieux (2016) evaluated a proposed implementation of Blockchain technology against ERM requirements in four standards, namely, ISO 15,489, Association of Records Managers and Administrators (ARMA) GARP, ISO 14,721 and ISO 16,363. The paper concluded that given the proper conditions of reliable information, security architecture and infrastructure management, Blockchain technology can address the present and near-term issues related to information integrity, but it is inadequate in serving as a longer-term preservation tool.

Social media

Social media is a group of technologies and ideological processes that enable collaborative content creation by general public users (Kaplan and Haenlein, 2010). The only work we found to address this topic was Xie (2016), which sought to apply the fundamental RM concepts of records creation and retention to the EU general data protection regulation's "right to be forgotten" law. The paper highlights the lack of records management engagement in the creation of the new law, which weakened the records-related requirements of the law. The paper recommends that the RM profession should be involved in future, law-making agendas that impact records management.

Case studies

Case studies are researcher reports on ERM implementations. Case studies include implementation, planning, success factors and lessons learned.

Implementation examples

Interest in ERM, its strategic planning and implementation, are on the rise in developing and emerging countries. Pakistan (Henriksen and Andersen, 2008), Nigeria (Popoola, 2009), Turkey (Külcü and Çakmak, 2010), Ghana (Akussah and Asamoah, 2015; Mensah and Adams, 2014) and Eastern/Southern Africa (Chigariro and Khumalo, 2018), illustrate this trend. Seeking to assess

benefits accrued from implementing ECM in South Africa, Katuu (2016) conducted a structured assessment. The results indicated a low level of maturity in South African institutions.

The use and impact of information and communication technologies in e-governance in the USA was analyzed by Dawes (2008). The paper found that out of the five objectives, three were well implemented, namely, policy framework, enhanced public services and improved government operations. The two lagging areas were enhancing democracy and exploration of institutional reform.

Another government case study of the EDRMS implementation was presented by Wilkins *et al.* (2009). Several factors were responsible for the success of the implementation at the City of Charles Sturt, Australia. These include upper management support, an open communication culture that encouraged staff involvement and clear, well-documented business and information technology strategies. Similar findings regarding ERM success factors were reported by Gunnlaugsdottir (2008), Hase and Galt (2011) and Haug (2012).

After evaluating over 100 previous research works and 6 well-known theories, Mukred *et al.* (2018) was able to identify factors that impact the adoption of ERMS in high professional education. A technology-organization-environment theory for factor classification and methodology was used to generate the proposed framework. Jaakonmäki *et al.* (2018) evaluated more than 1,200 industrial ECM case reports with the aim of creating a foundation upon which ECM can be better conceptualized and defined. They found that ECM projects differ considerably in terms of processes and technology deployed, and ECM scope and boundaries were broadened beyond the original plan.

A large-scale survey of more than 1,600 government agencies in Taiwan was conducted by Hu *et al.* (2010) to determine the satisfaction of participating agencies in the cross-agency use of an ERM system. The result showed that job relevance and good support services mediated the otherwise lower satisfaction impact of regulatory compliance with ERMS functionality.

In another study, Gunnlaugsdottir (2009) used a qualitative methodology to evaluate how employees of companies in Iceland use ERMS. The main issue uncovered was complaints about the user-friendliness of the ERMS application. However, ERMS was perceived as a constructive collaboration tool. Adoption increased when employees are well-trained and invited to participate in the creation of record classifications.

Email management

Email management is the approach of managing records in email for legal discovery and defensible disposition (Lappin *et al.*, 2018). Aiming to examine the effectiveness of the defensible deletion approach to government email management, Lappin *et al.* (2018) performed an evaluation study of government email policies in the UK. The paper found that the defensible deletion email policy at TNA is prevalent in the UK Government agencies and generally acknowledged as successful.

Park and Zwarich (2008) examined the email management policies of the Canadian Government agencies with the objective of finding the synergy between email management and the established records, document and information management system implementation. The study concluded that developing an email management policy enhanced the capture, management and retention of emails.

Open source

Open source is software developed for and consumed by public users (Hippel, 2001). Maican *et al.* (2016), as the only article in our collection that deals with open source implementation, proposed a system of architecture for supporting educational institutions using open-source ECM software. The study showed that an open-source ECM system worked well for an educational institution.

Technologies

For the purpose of this paper, we define ERM technologies as the tools and technical methods used for the MoReq. Model Specification is the most discussed sub-category with six articles, Big Data and Automatic Document Classification has three and two articles, respectively, and Content Services has only one article.

Model specification

Model specifications, also known as technical standards, are precise, formal specifications that are aimed to produce consistent results in the software created (Pearce-Moses, 2005).

The USA Department of Defense (DoD) was one of the early creators of ERM standards in the USA and evaluates ERM vendors on their DoD 5015.2 ERM Model specification, as noted by Swartz (2008). The author reviewed the DoD 5015.2 Version 3 showing the key additions were requirements for managing the FOI and Privacy Acts, email management and data interoperability, while changes were applied to access restrictions and alerts for changes in metadata fields.

A comprehensive background, definition, business drivers and technical functionalities of EDRMS was documented in Joseph (2008). The paper highlighted the dominant roles of USA DoD 5015.2 and Model Requirements for the MoReq specifications in setting the global EDRMS agenda via their certification programs. The article also identified ECMS as the new destination for EDRMS, with the latter becoming a sub-system in the ECM premise. The paper also discussed the emergence of SharePoint as a major competitor to existing EDRMS software offerings.

Evaluating MoReq2, Wilhelm (2009) found that while the specification is comprehensive and modern, it also promoted a culture of over regulation. The extensive details in MoReq2 also created a high economic impact on vendors and users of the resultant EDRMS system.

A comparative analysis of the Finnish National Archives ERM specification called SÄHKE against the European MoReq specification was done in Henttonen (2009). The study found that MoReq and SÄHKE are fundamentally different and a simple matching of the specifications was challenging as SÄHKE had only about 60 functional specifications, while MoReq2 had almost 800. The paper concluded that harmonization of the two standards would be impossible without a significant change of policy and specifications in Finland.

Furthermore, Vieira *et al.* (2012) criticized the MoReq2010 specification document as voluminous, complex and difficult to understand. The proposed improvements to the authoring quality using requirements engineering techniques, with suggestions to include the use of a pre-defined structure template, well-defined requirements quality criteria, traceability and prioritization.

In the fascinating case of Noark, the Norwegian model requirements for EDRMS was presented by Thurston and Sataslaatten (2014). Established in 1984, Noark has the world's most continuous model specification for EDRMS. Noark has transparency of governance in its core as stipulated by government regulation. All state agencies are required to publish the metadata of public records to a central Electronic Public Records system or Offentlig Elektronisk Post-journal (OEP) website using Noark compliant systems. The always available (online) status of OEP as stipulated by law is Noark's long-term preservation strategy, while records remain in agency server grids and databases. The perceived rigidity and complexity of Noark is offset by the simplicity of the OEP portal.

Querying the continued relevance of the archival theories behind the EDRMS implementation models, Lappin (2010) found that although the theories remain valid, there is a need to break through the stagnant status of EDRMS. The article forecasted a "records repository model," which would use a centralized business classification scheme as a back-end system, and the classifications applied to content held in the various applications in the records eco system.

Big data

Big Data is the storage, analysis and reporting on large-volume, complex, growing data sets with multiple, autonomous sources (Wu, 2013). Exploring the challenge created by the rise of the semantic web and unlimited storage, Serewicz (2010) asserts that for most organizations, the technical challenges of big data will be trivial in comparison with the managerial issues, and philosophical issues. Furthermore, the paper cautions that collective societal memory will be challenged by unlimited storage in space and time.

Referencing the staggering growth in the volume of digital archival information, Thurston *et al.* (2014) questioned the readiness of the information profession in dealing with the potential issues of big content. A case study of TNA's digitization of World War II service records revealed that beyond addressing digital preservation and format obsolesce, there are implications to the definition of the "original" archive and retention concepts. The paper proposed some approaches to the management of the legacy archives.

The first stage of iTrust, an international research initiative to develop specifications and formal record retention schedules for open data and big data was reported by McDonald (2014). Using a fictitious organization to describe the characteristics of open data and big data initiatives, the study developed a hypothesis that lay the foundation for real world case studies, the planned future work of the project.

Automatic document classification

Automatic document classification techniques use algorithms that learn from human classifications, as such, they can perform the classification task and humans, once provided adequate training (Calvo *et al.*, 2004). In a project called SEEK! sem, Lutz *et al.* (2013) created a machine-learning solution to solve the Enterprise Portal challenge of manually uploading documents to registry folders. The project used a rule-based recommender algorithm to automatically decide the destination folder and metadata for a document based on its content. The rules can be either provided upfront by human experts or machine-learned by the computer.

From an archival theory perspective, Makhlouf (2015) performed a set of tests on Swiss public records with the goal of demonstrating that digital diplomatics and quality dimensions can be measured through automation. The results indicate that up to 60% of the quality dimensions could be automated. The project proves that it is possible to graduate from the era of subjective records appraisal to using computer tools as appraisal decision-making aids.

Content services

Content services are electronically delivered content and/or resources provided by a producer for the benefit of consumers (Goldschmidt *et al.*, 2012). Exploring the concept of records management service delivery using a service work system framework, Goldschmidt *et al.* (2012) argued that the records management context should change from a simple system domain to a service paradigm. The need for change is caused by the impact of ERMS on the work processes and subsequent services in organizations. According to the authors, records management should harmonize with user needs and stakeholder considerations, to create a "fit for purpose" ERMS.

Discussion and conclusion

In this paper, we performed a comprehensive state-of-the-art review of ERM academic articles between the years 2008 and 2018. While we made effort to obtain quality and widely sourced articles, we caution that this review is limited to the materials available to us via the search tools of Google Scholar, DeepDyve and JStor and may omit other relevant articles. We consider our collection a representative sample of the current state of ERM research, to the best of our knowledge.

Our wide search for recent ERM articles resulted in over 4,000 articles. We narrowed the list down to 55 articles through a 3-step quality process. The study articles were then analyzed and categorized along similar topics. In this section, our key findings are summarized along the lines of the main ERM categories of *concepts, challenges, case studies* and *technologies*. We conclude with a summary of our work and suggestions for future research.

Articles in the *concepts* category cover several topics including archival theories that study the nature of records and other strategies for the management of records. The nature of records is identified as diverse and multi-faceted, especially when considering the cross-border relationships in the prototypical record and record-like articles (Yeo, 2008). These complexities can hinder the record appraisal process, but the "at creation" approach to record selection is considered an effective mitigation strategy (Cunningham, 2008). Other articles in the category discussed the need to balance both business and system processes, and further record classification research.

The leading ERM *challenge* is *people and information culture*, which adversely impacted ERM implementations. Furthermore, *long-term preservation* remains a challenge with no clear technology solution, while *social media* is under-developed and without a strong records management presence.

Case studies account for approximately a third of the articles in our collection (19 of 55), indicating that the majority of ERM research discussions in the 10-year period occurred in this area. While the advanced countries analyze post-implementation cases, the developing countries are in the planning and start-up phase. Email management is a notable success story, while open source software is presented as a viable option for ERM implementations.

The ERM *technology* requirement models specified by governmental/national archives for ERM implementations might have constrained technology innovation in ERM as vendors are mandated to provide compliant software to qualify for tender (Joseph, 2008), leading to fewer innovative features in standard ERM tools. For example, automatic document filing is not a part of standard, model-specified ERMS, but is a feature current technology can make available (Lutz *et al.*, 2013). SharePoint disrupted the ERMS software space as Microsoft leveraged its partnership alliances to attain a dominant status (Joseph, 2008). Content services are under-discussed in our collection, with only one article, and its impact on ERM in the past decade has been significant.

Our overall study goal of discovering the state of ERM research can be summarized by the reduced number of ERM-related published articles from 2008 to 2018 (Table 2). The diminished status of ERM research might be due to being embedded in the affiliate information systems areas of ECM and EIM and because the records management society no longer envisions it as a sub-disciplinary focus area. The RM society leading ISO 15489–1 (2016) concepts and principles publication omitted reference to the term "electronic record" in preference for "digital record." Several articles in our collection also interchangeably used "electronic" and "digital" as synonymous terms. The lack of clarity of the purpose of the new "digital" introduces a confusion that is, perhaps, a diversion from the ERM mission.

In terms of future work, we recommend that future literature review works branch out to publications in the domains of industry leading organizations such as ARMA, Association for Information and Image Management (AIIM) and Gartner Research to bring the latest records management innovations and thoughts into the ERM academy. In 2001, when AIIM International placed ERM under ECM (Blair, 2004), the impact was reduced focus on the ERM area. Now, starting from 2017, Gartner Research has renamed ECM to content services platform (CSP), to account for the cloud-based content services and has replaced ECM with CSP in their flagship magic quadrant yearly report (Marino, 2018). It would serve the RM

society best to assert influence not only in the new CSP field but also in other strategic records-related initiatives that can help improve (E) RM relevance.

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