

Effective Digital Information Management

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Summary

Today, the increasing volume of digital information is used more frequently and over longer periods of time, increasing the need for structure. How can we improve the management of these digital information flows while ensuring the quality of the information over time? The status of information management in a number of public authorities has been analysed by conducting two studies. Effective information management has been defined and we asked the authorities in what areas they would consider help useful in order to become more completely digital authorities. Through interviews and questionnaires we have also identified future challenges. These challenges mainly involve generating information that communicates, that is to say, we need to increase interoperability between business systems and more long-term solutions for preservation (e-archives). This is increasingly important, as many authorities are becoming out-sourcers, purchasing all services and products regardless of whether they are managing schools, railways or hospitals. This means that the benefit and value of the authorities is increasingly shifting towards managing and administering information – information that is often very long-lived. Another outcome of this review is identification of the need for a standardized, common information model shared by all information professions, regardless of whether one is a business architect, information security professional or an archivist. It is of utmost importance that we find techniques and methods to be able to work together to develop even more efficient sustainable information management.

Key words: information model, information architecture, information management, e-services, interoperability, e-archive

Introduction

In the last decade we have seen an increase and widespread re-use of information through various e-services. An important driver has been legal aspects in the finance sector, such as SOX and the European Basel III, collecting and gathering of information in the area of Environment and Health. Even the European PSI-directive, Public Sector Information from 1 July 2005 has actively influenced business to create more structured and complete digital information

flows for access (EU, 2015). There is also a more internal and business-driven reason for the growing amount of information. Business applications have been striving for full digital management and provision of online e-services 24 hours a day, seven days a week. The need for the business to support long-term customer and business relations requires information to be kept for many years. Using older data for statistics and analysis is a growing business, whether it is called Business Intelligence or Big Data (Digitaliser.dk 2015, E-delegationen 2013). In the near future, nearly all infrastructure and gadgets will include electronics, which in turn will be accessible online. This means that we are just at the beginning of an information avalanche. The storage industry expects the information to have grown by 50 times by 2020 all of which will require more storage space (EMC 21014)¹. The only thing we can say about the future of everyday life with some certainty is that there is an increasing amount of information that will be used for longer by growing numbers of people. Therefore it is becoming increasingly important to order information well at an early stage. Previous studies have also shown that we need better coordination and new tools to be able to handle the new challenges posed by the greater and more complex amount of data and information (NAS 2010, Anderson 2011, Borglund 2010, Anderson 2010, Foscarini 2012). Not least as many authorities are moving towards becoming solely purchasers of services and products, and only manage and administer information about what should be or has already been done (Regeringskansliet 2011).

Purpose

An overall aim of this article is to compile the knowledge we in the Centre for Digital Information Management received through two studies carried out during the autumn of 2014 and the spring of 2015. Using this knowledge we aim to:

- provide an in-depth understanding of what public authorities consider as challenges in the scenario outlined above, where the amount of information is increasing and which, to a greater extent, is created by others, rather than the authority itself.
- compile this knowledge and define important research and development efforts to optimize and prioritize information management and administration over time.

Methods

We have carried out two different studies, one covers all public authorities in two Swedish counties – Västernorrland and Jämtland (Study I). The other study

¹ It is often the storage industry that produces this data. Studies that show the extent to which the large increase is due to more unique or widely copied or overlapping information is missing.

was conducted at The Swedish Transport Administration (Study II). Both studies were conducted in the same way. The work was divided into two stages: the first stage consisted of a description of the current situation and an analysis based on reading public authorities' internal and external reports and articles, in addition to a number of interviews and focus groups with the aim of gaining an understanding of important information flows and challenges. The second part consisted of an analysis where we, through literature and interviews, tried to get an idea of which information flows and challenges could benefit from a more in-depth analysis and structured management to contribute a significant social benefit and possible research tasks.

Study I began with workshops with key personnel, in which the term information management was defined and operationalized. These concepts and definitions have then been used as the basis of a questionnaire sent to all units of public authorities (state, counties and municipalities) in the region, a total of 50 authorities, out of which 44 responded. Not all responses were complete; on average, each question was answered by 29 authorities (16 governmental, 13 municipalities and county councils, giving a response rate of 58 percent). The web survey tool used was Netigate, which provided a summary and graphic representation of all responses.²

Study II was an in-depth analysis of one of the country's largest public authorities. A series of focus groups that included various professions – business architects, system administrators, controllers, people working with information security etc. (in total, approximately 30 people) gave an overview of the challenges the authorities face. A list of questions was used as a starting point, but the focus groups were conducted as conversations, lasting between 1.5–2 hours and sometimes longer.

Results

The two exploratory studies were carried out during the autumn of 2014 and the spring of 2015.

Study I: A regional questionnaire

The outcomes of this study were:

- An analysis of the concept of (effective) information management (presented in Figure 1) and its status in the region (Samuelsson 2015-1, pp 43 ff).
- Proposals to increase technical development skills, for example by an e-service development of “export modules” for information from business

² For a more detailed review of the questionnaire see the report and Appendix 1, <http://www.miun.se/siteassets/forskning/center-och-institut/cedif/cedif-projekt/spif/slutrapport-for-strategisk-plattform-for-digital-informationsforvaltning-bil-1.pdf>.

systems and an adaption to the eGovernment Delegation’s and the National Archives’ Common Specifications for Government Agencies.³

The questionnaire sent to the authorities, structured according to these components revealed (in Figure 1) that the authorities need increased knowledge about how to analyse and identify quality requirements when creating and capturing information (Documentation, Registration and Records Management) in order to guarantee long-term preservation and reuse of information.

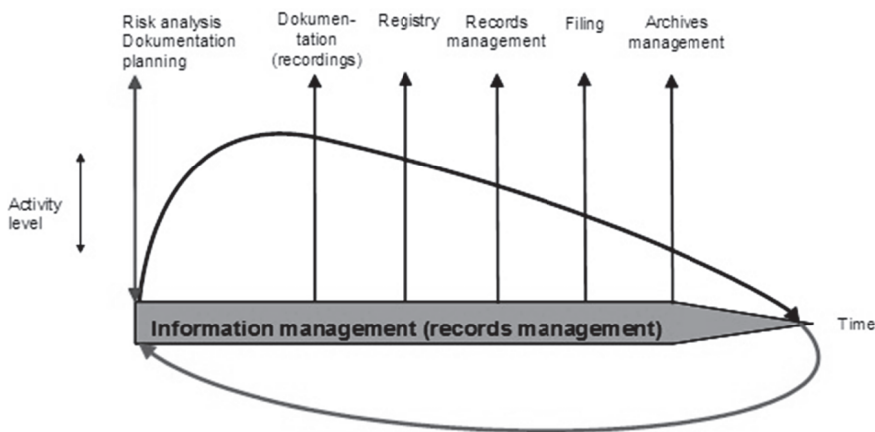


Figure 1. Components of digital information management

Based on the authorities’ responses, the following are promising areas for research and development:

- an in-depth understanding of the importance of documentation
- means for a coherent registration of all metadata, whether in specific business systems or more traditional records registration systems.
- methods for improved decision-making about documentation requirements and selection of systems for documentation.

In each section of the questionnaire the authorities were asked whether they would like help to develop the relevant part of the information model. The number of ‘No’-answers was never more than 20 percent (i.e. approximately 5/29). Thus there is great potential for joint development of solutions (Samuelsen 2015-1, pp 48 ff).

Our next step is to develop a more holistic model for information management, where a coordinated and structured management of the business’ registration is

³ Abbreviated in original language FGS, http://riksarkivet.se/Media/pdf-filer/Projekt/eARD_informationstext_eng.pdf

included. System management will be included, so that the proposed model will be able to handle and control the entire flow of business information. We also identified two additional functions to those usually included in definitions of information management: digital archiving and archive management, and the questionnaire revealed that these functions were handled very poorly. What is needed is a model to bridge the gap between the current business processes and archives. Such a model could be based on the initiative presented below – e-archive as a service. The following standards and tools will also be applied to the national and regional situation:

- ISO 30300, ISO15489, ISO 14721 as quality standards to guarantee information flows to the archive and for ingest compliant with the OAIS model. Inspiration and guidance will also be retrieved from Continuum Model (ISO 15489-1-2:2001, ISO 27001:2013, 30300:2011, ISO 14721, Cumming 2010, Foscarini 2012, McKemmish 2005).
- The National Archives' Common Specifications for Government Agencies (NAS, 2011).

Through discussion with the IT consultants and authorities involved, we have taken the first steps towards a more general tool for interoperability to handle digital archiving for much of the national public sector, using the working title “e-archive as a service”. A web service could be developed to find an export scheme (xml) for different business systems – salaries, staff, etc, guiding the user step by step through the process until the information has been packaged for export to an e-archive solution (Samuelsson 2015-1, pp 67 ff).

Study II: A large national government infrastructure authority

In this study the overall aim was to develop an in-depth understanding of requirements to maintain the value of information over the entire life-cycle. A project directory was compiled indicating important research and development for the future, in order to prioritize and optimize the authority's information management over time. (Samuelsson 2015-2, pp 23 ff).

Developing and managing durable physical infrastructure is important for this authority, making information highly valued and essential for operations in the long-term, although the use requirements for the information change with time. Interviewees mentioned difficulties preserving the value of information throughout the process for everyone involved. Connecting digital information and physical infrastructure is acknowledged to be a challenge. A uniform understanding of the value of information, within the authority as well as among external stakeholders is necessary in order to link information management with business processes and IT support (and the infrastructure).

A particular challenge is ensuring more efficient reporting of information from various external actors. The authority is a purchaser of services and increasingly, information management tasks are handled by external actors. Thus the authority sets requirements rather than carrying out the information manage-

ment tasks itself. The challenge is to develop procedures to ensure that regulatory requirements are met. This also raises the question of appraisal at an early stage, where requirements for information creation and capture must be set as for example in large infrastructure investment projects.

With the transition to the role of purchaser, challenges in terms of trusting the authority and its activities emerge. An important question raised is how to maintain trust in the management of critical information when the information is produced and managed by external actors. The information must be auditable to ensure that the authority, as purchaser, knows that it has received what was requested, thus securing control for democratic purposes. These issues are crucial not only to ensure the authority is up to date, but also to be an authority citizens and decision-makers trust.

The results from the focus groups have been analysed (Samuelsson 2015-2, pp. 30 ff). Five areas of priority for research and development have been identified:

The role

The role of the authority as purchaser enhances the importance of information in processes of management and control, where it serves as an instrument of control. Because the authority is a public and a democratically controlled organisation, it is also a question of democracy to ensure the political control of its operation, in addition to ensuring that the authority has access to all information of relevance. The information is necessary to be able to maintain, control and manage the infrastructure over time.

Key information flows

Two key information flows have been identified as high priority are 1) the investment process, from planning to implementation and maintenance and, 2) management and governance processes. The latter is crucial for efficient information management to support the implementation of the authority's goals and strategic standpoints. It is also important given the transition to a role as purchaser, in which the authority becomes the client.

Business architecture – a common information model

The authority has begun to develop information and business architecture for a number of areas of work (E-delegationen 2013, Lindström, L. 2011, Nordström 2013). This is an important start, but developing a more uniform and joint information model must advance at a faster rate. Currently, a number of different information professionals are involved in information management and administration, and synchronization is needed. A second step could be to develop an information model integrating different approaches, also taking into account long-term preservation.

Information value and benefit

Different information professionals carry out different forms of appraisal of information, e.g. in archives, architecture, and information security. For example, in order to classify information security, the information must be identified and appraised. The question is how these appraisals relate to the appraisals carried out in the archive sector which aim to assess information based on what should be preserved or discarded. A prioritized research issue is to develop theoretical approaches, models and methods for appraisal of which information should be preserved which takes other perspectives into account. A first step is to identify how appraisal of information from different professionals (architects, archivists and heads of information security etc.) is currently carried out. The second step will be to develop models and methods for coherent information appraisal, taking all perspectives into account.

Quality

A related issue is how to guarantee information quality over time, where many activities with different information needs are involved. This also applies to information management functions handled by external actors, in a complex and ever-changing context. The authority seems to be extensively duplicating work because of a lack of trust in the quality of the information, resulting in increased costs. The extent of this has, however, not been assessed in this study. In archival science quality parameters such as authenticity, reliability and useability are defined. Whether these are sufficient and useful in this context and in this authority is also important to investigate.

Conclusions

In order for these authorities' information to be able to contribute to a wider societal perspective, rather than a narrower perspective that serves only the authorities' needs, a holistic approach to information management is required. Developing theoretical approaches, models and methods for appraisal of information and determining what should be preserved must be a high priority. This should be based on a wider societal perspective where the authorities' role as outsourcers and purchasers should be taken into account. The development of more uniform information models will be necessary, through which different information professionals are able to collaborate, be they information or systems architects, information security professionals, archivists, system administrators and others with an interest in high quality, authentic information, accessible and usable in future for as long as necessary.

The most important conclusion is that it must be possible to exchange information; without interoperability we will not be able to build functioning digital businesses or digital societies, Communicating here and now, between internal and external business systems, as well as over the long-term. To create a more

fully efficient digital information management, have we in this article underlined the importance of having:

- order and tidiness and a well thought out information management
- a common information model
- an enhanced interoperability where we suggests the an implementation of an e-archive can constitute “a common minimum level” of interoperable information. Here, we have proposed a development of one e-service, which among others consists of an “Export module” where the information can be exported from the business systems to the e-archive solutions – “e-archive as a service”.

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