Keeping or Discarding Records
A Comparison and a Practical Use of Influential Standards for Electronic Records Management

Bachelor’s Thesis

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Abstract

The management of records is an essential part of any organization. Today this implies the management of mostly digital records in electronic record management systems. There are many standards for record management. Three influential standards was compared and used to evaluate such an electronic record management system in this thesis. The purposes of the thesis was to find out how the core features support and interfere with each other, and which changes could be done to a system evaluated according to the standards, as well as what the major challenges were when using document standards to evaluate an electronic record management system. The standards were MoReq2010, ISO 15489 and DoD 5012.02. To conform to the standards, some changes could be done to the studied system. For instance, changing document keys and to include more metadata about disposal of records. The conclusions were that standards are a good complementary source when developing an existing record management system, even though their size and complexity level are issues to deal with.

Acknowledgements

Thanks to Camilla Wohlgemuth who was my mentor at IFS and Örjan Dahlström who was my mentor from the University. I also want to thank the service and asset team at IFS who was all very nice and made my time at the company enjoyable.
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1. Introduction

This chapter gives a background to document standards, and finishes with the problem description for the thesis.

1.1 Document Management
Keeping and preserving records have always been necessary for companies and governments. According to Vieira, Valdez and Borbinha (2011) the management of records is an essential part of any organization and is considered a good business practice and brings transparency, compliance, legal pursuance and process efficiency to the business in question. Managing records imply some kind of system for storing, retrieving, approving, keeping, archiving, and everything else that needs to be done with records in a company. The documents generated by a business ranges from physical paper documents in the form of books, newspapers, passports, binders etc, to digital file types in the form of doc, pdf, htm, xml etcetera according to Ferilli (2011). Advantages of using digital records instead of physical records are the ease of storage, transmission and reproduction. It also makes it easier to find relevant documents through indexing according to content and separately stored metadata.

1.2 Electronic Record Management Systems
Records have been in the form of physical paper documents for a long time. This has rapidly changed to a record keeping in digital form according to the DLM Forum (2011). To manage records in digital form it resulted in a need for Electronic Records Management Systems (ERMS). There are many advantages of storing records digitally in an ERMS. These include the ones written above, as well as the advantages of having certain automated function possible in a system and of the space and effort it saves to have every record in a system. According to Becker, Antunes, Barateiro, Vieira and Borbinha (2011) there is a challenge in preserving records that are stored in a digital format for an unforeseeable future because of rapid changes in technology and the complexity of businesses. They mean that this is a problem that combines organizational and technical challenges. Managing and keeping digital records correctly does not have a single solution and unified requirements for every business or government that needs to preserve its records. There are different laws concerning the keeping of records in different countries. The regulations may also vary between the public and the private sector or have special regulations for the military or other private bodies. Because of these differences in laws, regulations and business needs, a number of different standards dealing with document management have been written.

1.3 Standards for Document Management
The management of records is an increasingly complex process and therefore standards and requirements have emerged to assist organizations to manage digital records (Vieira, Valdez and Borbhina, 2011). According to Christensen (2009) standards are documents that contain requirements for ERMSs. They are used for designing, reviewing and/or implementing ERMSs and are used by software vendors and developers. Creating standards within a certain domain can also be to provide a common language within that domain (Parasto, 2011). There are numerous standards for document management for different purposes, answering to land-
specific regulations, or with a more global scope. Some standards used for document management (in English) at a global or land-specific level are presented in table 1 and ISO standards that are in some way related to document management are presented in Table 2.

Table 1 – Some National and International Document Management Standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Country of creation</th>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DoD 5015.02-STD</td>
<td>USA</td>
<td>2007</td>
<td>United state Department of Defense standard for electronic recordkeeping</td>
</tr>
<tr>
<td>EDRMS Functional Specification Standard</td>
<td>Australia</td>
<td>2009</td>
<td>Australian standard for electronic recordkeeping by the National Archives</td>
</tr>
<tr>
<td>ICA-req</td>
<td>Global</td>
<td>2008</td>
<td>Principles and functional requirements for records in electronic office</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>environments by the International Council on Archives</td>
</tr>
<tr>
<td>InterPARES 2</td>
<td>Global</td>
<td>2007</td>
<td>International collaborative project to develop concepts that can ensure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>the creation, maintenance and preservation of authentic records</td>
</tr>
<tr>
<td>MoReq2010</td>
<td>Europe</td>
<td>2010</td>
<td>Model Requirements by the DLM forum that forms a guideline for electronic</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>recordkeeping</td>
</tr>
<tr>
<td>NOARK 5</td>
<td>Norway</td>
<td>2009</td>
<td>Norwegian standard for electronic recordkeeping in the public sector</td>
</tr>
<tr>
<td>PRO2002</td>
<td>UK</td>
<td>2002</td>
<td>Specification for electronic records management systems by the Public</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Record Office in the United Kingdom</td>
</tr>
<tr>
<td>RDIM</td>
<td>Canada</td>
<td>1996</td>
<td>Records/Document/Information Management for the government of Canada</td>
</tr>
<tr>
<td>Submission to the Object Management Group</td>
<td>USA</td>
<td>2009</td>
<td>Records management standard by CA CSC Lockheed Martin Corporation and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Visumpoint</td>
</tr>
<tr>
<td>VERS (Victorian Electronic Records Strategy)</td>
<td>Australia</td>
<td>2003</td>
<td>The Victorian Electronic Records Strategy by the Public Record Office of</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Victoria</td>
</tr>
</tbody>
</table>
Table 2 – Some ISO Standards Related to Document Management.

<table>
<thead>
<tr>
<th>ISO-Standard Related to Document Management</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO 14721:2003</td>
<td>Standard for the preservation of archival records</td>
</tr>
<tr>
<td>ISO 15489-1:2001</td>
<td>International standard for records and management design</td>
</tr>
<tr>
<td>ISO 23081-2:2009</td>
<td>International standard for metadata for records</td>
</tr>
<tr>
<td>ISO 30300:2011</td>
<td>Information and documentation - Management systems for records</td>
</tr>
<tr>
<td>ISO 9001:2000</td>
<td>Quality management systems - Requirements</td>
</tr>
<tr>
<td>ISO 16175</td>
<td>Principles and functional requirements for records in electronic office environments</td>
</tr>
</tbody>
</table>

1.4 Glossary

*Standard:* When used in this thesis the word standard refers to standards for document management. The word standard is also used for MoReq2010 even though it is a guideline and not an official standard.

*ERMS:* This is the term that will be used in this thesis for a system that manages electronic records. The definition is in MoReq2010 and stands for Electronic Records Management System.

*Records:* According to ISO 15489, a record is “information created, received and maintained as evidence and information by an organization or person, in pursuance of legal obligations or in the transaction of business”. In this thesis this term will be used for the entity that contains all of the metadata that describes an actual pdf-file or other digital document, as well as the actual document.

*Document:* IFS uses the word document for what the standards refer to as a record. When talking about IFS DocMan the word Document will be used. The term is also used when referring to an actual physical or digital document without the associated metadata.

*Metadata:* This is information about a physical or electronic record, or something else in an ERMS. It can for example be creation date, title, who is allowed access or anything else. Metadata-entity is the term that will be used when a specific form of metadata is been referred to.

*Core features:* In this thesis what is called mandatory requirements, core processes or core services in the different standards are given the common name core feature to be able to talk about them collectively.

*Aggregation:* This is the term used in the standard MoReq2010 for folders and files, to demonstrate that it can have any number of levels of hierarchy and can be a multilevel hierarchy in its own right. The functionality is essentially the same as a folder. This is the
term that will be used in this thesis referring to everything that has the functionality of a folder.

1.5 Previous Research
There is some earlier research in the field of standards. There are different ways in which that research is carried out. Standards can be used to evaluate some sort of system. Standards can also get compared or get viewed from another perspective. The previous research that was of most interest to this study deals in some way with standards for document management. To the best of my knowledge, there is not yet any study within the field of document management for using standards to evaluate a particular system. Research on using standards within other fields to evaluate systems or organizations was found. One example of that was a master thesis also done for IFS where the standard ISO 15926 was used to investigate the interoperability of IFS Applications.

One example was found that compared standards for document management. Henttonen (2009) compared MoReq2 with the Finnish standard SÄHKE. His conclusion was that they differ in entities assumed by the data model and in the suggested metadata elements. Henttonen (2009) claims this is because of their different purposes that are for instance MoReq2s more technical focus while SÄHKE guides electronic record management at a general level, and that MoReq2 is written to support compliance testing.

Another related study was one that analyzed MoReq2010 from the perspective of TOGAF (the Open Group Architecture Framework) which is an enterprise architecture framework. The conclusion from that study according to Veira, Valdez and Borbinha (2011) was that MoReq2010 is not complete enough to be used as an architecture requirement specification in the scope of TOGAF.

Besides these reports there are a number of articles and blog posts that deal with standards for document management and their use. Not much is written about them in scientific journals, and no study was found where the standards used in this thesis were compared and used to evaluate an ERMS.

1.6 Problem Description
There are numerous standards for document management available, some global and some targeted to a specific country. Companies are increasingly demanding the ERMS they use to be certified or created in accordance to a certain standard. In this thesis the use of standards will be investigated in a specific ERMS: IFS Applications. Currently, IFS experience an increasing demand to certify according to standards. Therefore IFS wants to investigate the most influential standards to see how their system differs from the requirements in the standards. These requests from IFS World led to the following research questions:

1. What are the core features of the most influential standards for document management?
2. How do the core features of the most influential standards for document management support or interfere with each other?

3. What changes could be suggested in an existing electronic records management system compared to core features of the standards?

4. What are the major challenges when using influential standards for document management to evaluate and develop an existing electronic records management system?
2. Background

In this chapter, the ERMS evaluated is described as well as the methodological viewpoint of this thesis. Finally, usability heuristics and linguistic concepts used are described.

2.1 Document Management in IFS Applications

IFS Applications is an Enterprise Resource Planning (ERP) system by IFS that aids companies manage 4 core processes: service and asset, project, manufacturing and supply chain (www.ifsworld.com). Through every process there are cross-functional components. Document Management is an example of such a cross-functional component. Documentation Management within IFS Applications handles creation and development of documents, including searching, workflow, templates, revision handling and release management, support for invoice scanning and redlining. It is in the form of a Windows-application, but it also has a web-based interface. It is not an ERMS per say since it is part of an ERP, but it has the functionality and will be evaluated in this thesis according to standards for Document Management. The documentation part of IFS Application evaluated in this thesis is hereafter referred to as IFS DocMan.

The structure of IFS DocMan is presented in Figure 1. What is evaluated in this thesis is the basic configuration of IFS DocMan, but almost every attribute of the system is configurable in accordance to requirements of customers using the system.

![Conceptual structure of how a document relates to parts in IFS Applications](image)

Figure 1 – Conceptual structure of how a document relates to parts in IFS Applications

In IFS DocMan a ‘Document’ refers to the collection of metadata that describes a working document, and the working document itself. The document can be in physical (binder, paper, CD, DVD) or electronic (cad, pdf, doc etcetera) form. Every document has a document key.
The key consists of a document class, a document number, a document sheet and a document revision, which can be seen in figure 1 under document 1 and in the first boxes in figure 3. Every document class can have more than one number, every number can have more than one sheet and every sheet can have more than one revision. It is the combination of all four entities that is unique for every document. In IFS DocMan the document class refers to different document types, like artwork, specification, drawing or certificate. The possible document classes are configurable to every business IFS Applications is used in. In the settings page for the document class (Figure 2), it is possible to set default values for expiration dates, templates and every other value that can be connected to a class. There are default metadata for new classes, which are possible to override for every value.

In addition to a unique key every documents needs more metadata to describe what can be done with it by who and how it relates to other documents or entities in the system. This can be made at a specific page (Figure 3 a and b). The access for example, which means who is allowed to view or edit the document, is entered under the tab ‘Access’ in Figure 3. Other examples of additional metadata can be the format in which the document can be printed or the approval process.

Below in Figure 3 a) and b) is the page where all the information about a document can be seen in IFS. At the page displaying document information (Figure 3 a and b) records are created and given a class, a number, a status, a title and all necessary metadata. The layout of the page, which will be called “revision layout” in this thesis, is the same for all records in creation. It is also possible to create a document through the attachment panel. The system is configurable in most aspects to conform to the customers’ exact needs. The configuration below displays all fields that are available. Other fields can also be added if needed.
There are three ways to give a document a business context. First, there is the possibility to tie Documents to Business Objects, to put them in document folders or to tie them to other documents. None to many different context giving actions can be performed on one document.

The business object is a type of entity that can be everything that a user of the system works with. It can represent a project, a work-order, case, supplier, engineering part etcetera. The business objects are of different types and every type has a combination of other entities in the system that it can get connected to. These connections can either be to only documents or to other business objects and other entities in the system as well depending on the business object.

A second way to give a document a business context is the document folder entity, which is a special kind of business object. Instead of having cross-connections like the other types of business objects, they have a hierarchical tree-structure to them. It is possible to have Documents at every level in the tree-structure of folders. The purpose of folders is to group documents in a logical way. What is not clear in the system (see Figure 1) is that folders do not have to have a parent folder, which means that there can be an unlimited amount of folder structures in the system.
A third possibility to give a document a business context is to tie the document directly to another document. This is done by a feature called document structure and is a valuable function when for example two documents are related and need a clear connection to each other but have different approval processes or needs to have different revisions.

Example of Document Life Cycle
In IFS DocMan every record goes through a certain process (conceptually presented in Figure 4).

![Figure 4 – Conceptual description of Document Life Cycle in IFS DocMan](image)

The life cycle of a document starts with the creation of the document which can be done in document revision which is the page shown in figure 3. There the record must get a class, sheet, revision and number to give it a unique document key. In this example the document is a powerpoint-presentation related to a project. Thereafter additional metadata can be added to the record, for example who is allowed to view it, edit it, and which other objects are related. In the case of the powerpoint-presentation related objects could be the project in question or the certain business element the presentation is about. When every relevant metadata-element is added to the record, the record itself needs to be added if it is an electronic document. This is done by checking it in. Now the document is in the system and people with the right access can view or edit it. To edit with the document it needs to be checked out so that no one else can edit it while one user makes changes in the document. It can still be viewed though. When the editing is done it needs to be checked in again to the system. Thereafter the document goes through the approval and release processes. The approval process ensures that all departments/persons affected by those documents have the opportunity to read/edit them. When every necessary change to a document is done it can be released, which means that no further changes can be done.

A record never automatically disappears from the system, it only alerts when the date obsolete has arrived if that certain metadata-element is added in the creation of the record. The date obsolete can be set at any of the stages presented in Figure 4.
2.2 Methodological View
This study was conducted by first reading standards for electronic record management, then to link the intuitively connected core features to one another. Thereafter an ERMS was evaluated by comparing the core features of the standards seen as a unit to the functionality of the system. This approach is based in qualitative data, which means that it is unquantifiable data written by people for a certain domain (Allwood and Erikson, 2010). The result was in form of a description, comparison and a practical use of the standards. This can be considered to be a hermeneutic method since it is a form of study and interpretation of written text (Allwood and Erikson, 2010). The authors mean that the pre-understanding of people give the frames in which the understanding of the object studied will be portrayed. This position is within most forms of hermeneutics. The pre-understanding when writing this thesis concerns the terminology used and the concept of classification. The pre-understanding is also about how programs and systems usually work, which is inevitably applied when using and evaluating a system like IFS DocMan.

Ontologies
There are several definitions of ontologies in different fields that all have different uses. Two examples of the use of ontologies are the philosophical notion investigating questions like “what exists”, or the concept within modern computer science according to Staab and Studer (2009). The last type of ontologies is within computer science, and has the most common definition “An ontology is a formal, explicit specification of a shared conceptualization” (in Gruber, 1993) according to Staab and Studer (2009) and Densel (2001). Its main use is for the semantic web, where the ontologies should be machine readable to provide formality according to Fensel (2004).

The use of the term ontologies can also be that of a framework for understanding a certain domain. Jonsson (2004) describes ontologies as a term used to refer to a shared understanding in a certain domain, and is used as a combined framework to solve problems that arise when a shared understanding is lacking. In this thesis this this final meaning of ontologies is used. The term is used as a meta-perspective to describe the terminology within standards for document management.

2.3 Linguistic Concepts
Since the main part of this thesis is a comparison between three standards, which are essentially texts from the same domain, some linguistic needs to be taken into account. The linguistic concepts that are relevant to this thesis are classification, semantics, syntax and pragmatics which will be explained below.

Meaning through language
According to Saeed (2009), both pragmatics and semantics deals with the meaning through language. Semantic deals with the meaning of words where they are used and pragmatics deal more specifically with the meaning of words to their interpreters. The field that merely describes the relation of words is the field of syntax according to Saeed (2009)
Classification
Every line of work has a set of categories, standards or means for interoperating infrastructural technologies and categories within a certain domain shape the policies, standards and way of thinking within that domain (Bowker and Star, 1999). In Document Management those categories are referred to as classification. This word will be used to describe the sorting of entities according to pre-defined criteria in this thesis.

Synonymy
Saeed (2009) mean that synonyms are different words which have the same or similar meanings. He also points out that true or exact synonyms are very rare and that they are often distributed differently along a number of parameters. They can for example belong to different situations, formal, informal etcetera.

2.4 Usability
Even though the ERMS in this thesis is evaluated by standards for document management, it is still supposed to be used by actual people in the end. According to Heim (2007), efficiency/usability is one of the factors that make someone want to actually use the system in question among effectiveness/usefulness. Nielsen (2005) describes ten usability heuristics (the ones most relevant to this thesis are explained more detailed):

Visibility of system status
   The system should always keep users informed about what is going on through appropriate feedback.

Match between system and the real world
   The system should use known terms rather than system-oriented terms, follow real-world conventions to make the information appear in a natural and logical order.

User control and freedom

Consistency and standards
   Users should not wonder whether different words, situations or actions mean the same thing, but platform conventions should be followed.

Error prevention

Recognition rather than recall
   Objects, actions and options should be visible rather than having the user remember information and dialogs.

Flexibility and efficiency of use

Aesthetic and minimalist design
   Only relevant information should be visible. Irrelevant or rarely needed information in a dialogue competes with the relevant information and diminishes their relative visibility.

Help users recognize, diagnose, and recover from errors

Help and documentation
3. Method

To be able to answer the question of the core functionalities for the most influential standards, it was necessary to find the existing standards and from there to assess which are the most influential ones. Thereafter a comparison between the standards was made, and the information from the description of the standards and the comparison between them was used to evaluate a real ERMS, IFS DocMan, to be able to answer the last question. This procedure is illustrated in figure 5.

![Figure 5](image_url) – Illustration of the method used to answer the questions in this thesis.

3.1 Influential Standards

To find the most influential standards for document management, a global search of which standards are used for document management needed to be done. The first step was to search the website of MoReq2, which was already known by the company, for related standards. There most of the land specific standards were listed, with their relationships to MoReq2 (www.moreq2.com/). These standards were briefly looked into for information of further references in the shape of other relating standards. Additional ISO-standards and other standards related to document management were found in that process, as well as more current versions of standards. An example of different versions was the standard MoReq2 which had been updated to the more current version MoReq2010. The standards found in the global search are presented in table 1, and the most frequently used ISO-standards related to the standards for document management are listed in table 2 in the Introduction.

When the list of global and land specific standards was complete, some industry specific standards were discussed. These were standards written by companies that had connections to specific industries, addressing document management.

This led to standards at three levels. The levels were the global level, the land specific level and the industry-specific level. At that stage the management at IFS was consulted to find out what to focus on when investigating the standard and which level would be best. The answer was that the industry-specific standards were too specific, and have already been used by the company before, which means that they would not benefit from a comparison between them. Therefore the chosen standards ought to be global or land specific standards that are most mentioned in literature and on other ERMS homepages. It was concluded that the chosen
number of standards should be three and not more, because of their size. Another reason to not compare more standards was to make the comparison between them possible to overview. The three chosen standards are presented in the results.

3.2 Core Features of Standards
To be able to describe the standards, their purpose and goals needed to be clarified to know what the standard in question aims at. Then the structure of the standard was looked at to get an overview of the contents and the important parts in them. It was decided that only the core features was to be taken into account when describing and comparing the standards. This means for example that no non-mandatory requirements, specific requirements according to the privacy act or surrounding or describing policies around ERMSs were described and compared. After the standards were thoroughly read through, every core feature was summarized and presented in the result of this thesis.

3.3 Comparison of Standards’ Core Features
After the standards were described, the core features were compared. This was done by choosing the most detailed standard as a base for the comparison. The core features of the two other standards were compared to those of the most detailed standard, and the connections were visualized. Then the comparison was described in more detail to give a clear view of their similarities and differences.

3.4 Challenges of standard-implementation in an existing ERMS
The evaluation of the ERMS can be viewed as a form of case study. According to Runeson and Höst (2008) a case study means “investigating contemporary phenomena in their context”. The method in this thesis is a mix of an explanatory and an improving case study. Explanatory means finding out what is happening, seeking new insights and generating ideas and hypotheses for new research. Improving research means trying to improve a certain aspect of the research phenomenon (Runeson and Höst, 2008). Case studies are conducted in real world settings rather than in laboratory settings, which gives them a higher degree of realism according to Runeson and Höst (2008). The drawback with case studies can be the level of control.

The ERMS was systematically evaluated in accordance with the standards. Every core feature from the most detailed standard was read and compared with the functionality in the ERMS. Differences in terminology and functionality between the ERMS and the core features of the standards were described. At this stage all of the standards were viewed as united and it was not considered which standard the requirement was from. The standards were at this point observed from an ontological perspective (see theoretical framework). The evaluation was made at a general structural level, and the more specific details from the standards were not taken into account. What level the evaluation was done from came from a personal judgment after having briefly read the standards and got a basic understanding of IFS DocMan. More specific suggestions are discussed.
4. Results

The results section is divided into four parts. First a description of the chosen standards, second a comparison based on the descriptions and finally the standards are used to evaluate IFS DocMan.

4.1 Influential Standards

The three most influential standards were chosen in cooperation with representatives from IFS. The standards are MoReq2010, ISO 15489, and DoD 5012.02. MoReq2010 was chosen as the most thorough and influential standard for companies and governments in Europe and globally based on the number of times it was mentioned in other standards and on the webpages of companies dealing with document management. Then ISO 14589 was chosen because it was mentioned in almost all of the standards listed in the introduction in table 1 as a base. The DoD 5012.02 by the American Department of Defense was chosen because of how influential and frequently used it is in the ERMS-business and the great number of ERMSs that are certified to it.

4.1.1 MoReq2010

The MoReq2010 standard is the newest version of the international standards from the DLM Forum. MoReq stands for Modular Requirements. The name is taken because the requirements are structured in modules of functionality. MoReq2010 is the update of the second version of MoReq – MoReq2 in 2008. According to the DLM Forum (2011) it is not a de jure standard, but rather a specification. Despite its formal definition as specification rather than standard, it is recognized as a standard according to the DLM Forum (2011). The focus is on interoperability which they mean is essential for records in an ERMS. That is because organizations refresh their technology often and need correctly kept record in transitions as well. It is possible to get certified according to MoReq2010, in which case the ERMS must fulfill all of the functional requirements specified in the standard. These are the core features that an ERMS must have according to the DLM Forum (2011):

User and Group Service

Data and historical information about users and groups should be available, and every user or group should be represented with entities to represent them. When the user or group is no longer active it should be put in a residual state so that the context of the user or group will still be available.

Role Service

The role service concerns who is authorized to do what in an ERMS. There are many functions in an ERMS and it would be impractical to assign them to users and groups individually. The roles are based on a coherent set of functions to describe each position within an organization.

Classification Service

Classification in this case means that every record must be associated with a class entity from its creation to give the record a definitive context and a link to other relevant records. The
classes represent business functions, activities and transactions and can be defined by the business. In MoReq2010 the records are placed in aggregations that are also classified so that they can inherit the class of the parent aggregation. Aggregations represent what is normally called files or folders and has the purpose of organization for operational convenience and inheritance of classes. They will be further explained under record service.

The classes are organized in a classification service that follows a classification scheme, which is the way of arranging the classes within the classification service. An example of a classification scheme is classes arranged hierarchically in tree structures where only the child classes are used to classify records and aggregations. It should be possible for the authorized user to create new classes, to modify existing classes, delete classes, to replace a class with another and to re-classify records and aggregations. The classes could be inherited through the aggregations, with the disposal schedule following, however this is only possible if the records contained within an aggregation are homogenous. The automatically inherited class should be possible to override.

**Record Service**
A record service manages records within the ERMS under different levels of aggregation. Each aggregation can represent a group of records or other aggregations and the classifications, access controls and metadata is inherited. It is not allowed to have aggregations and records at the same level. Root aggregations are not the children of other aggregations. Each record is an entity that is made up of its metadata, event history, components and access control list. There can be as many aggregations as needed. It is possible to make duplicates of records to have them in different aggregations for business purposes. In that case the duplicate is treated as a separate record with its own history and metadata.

**Model Metadata Service**
To facilitate interoperability, an ERMS must have a standardized set of metadata to its records. MoReq2010 describes ‘system metadata’ which is the metadata that is minimally required for an ERMS and ‘contextual metadata’ that is applied within a localized context.

**Disposal Scheduling Service**
A disposal service manages the life cycle of all the records in an ERMS. A record can never be fully deleted. There will always be a remaining residual record to prove its existence. Instead of complete deletion the record will go through a transition from an active entity with complete metadata, history and content to a version with parts erased. The disposal schedule determines when this process will occur. Every record, aggregation and class must have a disposal schedule, and the disposal schedule must have one of the four following outcomes:

- retain permanently;
- review at the end of the retention period;
- transfer at the end of the retention period;
• Destroy at the end of the retention period.

**Disposal Holding Service**
A disposal hold is an administrative, often legal, order that interrupts the normal disposal process and prevents the destruction of records.

**Searching and Reporting Service**
It must be possible to browse an entity to its related entities, or to search for them based on values in their metadata and for the user to view what he or she has allowed access to. It should be possible to search in full-text and find all metadata and be able to combine results of searches to perform complex searches. The search results are always expressed as a list of entities, and the appearance of this list should be configurable by the user. The reporting service refers to a return of a subset of metadata for each entity in the results.

**Export Service.**
Export refers to the operation by which entities can be described in the sufficient detail so that the metadata values, event histories, access controls and content can be transferred to another ERMS. This is done in a common XML data format. Related to export is import where records from another ERMS are imported to the one in use. What should not be exported is the searching and reporting service described above. For every export an export identifier must be created to make it possible to find the entities exported together. When it is possibly to export entities from one ERMS to another without losing the business context, interoperability is achieved.

In addition to the functional requirements explained above there are a number of non-functional requirements that are listed in the appendix. These are operational, infrastructural or comfort factors. They are more difficult to specify universally and to measure and test subjectively. They are nonetheless important for the use of an ERMS according to MoReq 2010.

**4.1.2 ISO 15489**
The ISO 15489-standard provided by the International Organization for Standardization is an international ISO-standard that provides guidance on managing records (www.ssi.se). The full name of the standard is ISO 15489: Information and documentation – records management. It was published in 2001 and is the most influential standard in record management internationally according to the DLM Forum Foundation (2011). According to the ISO-homepage, many other standards for document management are in some way based on this ISO standard.

The purpose of ISO 15489 (2001) is to provide guidance on managing records, both physical and electronic. It covers how the records are to be created, captured and managed. According to the homepage of the Swedish Standards Institute it gives instructions for document management in public as well as the private sector, for internal and external customers. ISO 15489 has two parts. Part one is the more general part where the concept of a record is
explained and the responsibilities of organizations when records are handled are explained and part two consists of guidelines to perform records management.

According to ISO 15489:2 (2001), the core features of the records management process comprises of the elements in the list below. They are presented in the order that records would be managed if they were in a physical form. ISO 15489-2 (2001) claims that all processes generate metadata, but the exact kind of metadata may vary between businesses.

**Capture**
This is the process of determining which records should be kept, for how long and who have access to them. Also metadata connected to the documents should be kept in a way that it describes the context, content and structure of the record, as well as information about the people involved in the transaction. The detail level depends on the business need and range of use of the record. The process of capture is the same as the process of registration described below in ERMSs.

**Registration**
The purpose of registration is to provide evidence that a record has been created or captured in an ERMS and a way of formalizing the capture of the record into an ERMS. Records can be registered at several levels of aggregations. The metadata kept in the registration are for example identifier, date and time, title, author, etcetera.

**Classification**
This is the process of identifying the category of business activity and to group records within them. This is done to facilitate description, control, links and determination of disposal and access. To be able to retrieve documents by free text searches and the display of useful indexing terms is mentioned here. Indexing is also mentioned here, and the importance of correct index for easy retrieval. The index can be in form of format, title, subject content, etcetera.

**Access and security classification**
This is related to classification and deals with restrictions to access because of legally classified records to protect personal information, intellectual property rights, and other legal and professional privileges. A record is restricted only when it is specifically required by business need or law.

**Identification of disposal status**
This is the process of identifying the disposal status and retention period of the record. To do this the business activity, the records class and the relevant retention period must be determined, as well as which metadata to be retained and which is to be destroyed.

**Storage**
Storage ensures that records are protected, accessible and managed cost-effectively. Regarding electronic storage backup-systems to prevent loss of records through system failures, maintenance processes to prevent from physical damage and copies into newer
version to prevent from data erosion is needed. Electronic records should be stored in a way to make their retrieval easy and fast.

**Use and tracking**
User permissions associated with individuals should be identified as well as the access and security status of records for their use. When a record is used it should be tracked in the metadata because it may affect its access and disposal status.

**Implementation of disposal**
It should be possible to retain electronic records and associated metadata removed from the system to ensure that the information is available through the whole retention period. When the retention period is over the records should be destroyed which can be by reformatting or rewriting. In certain cases records are transferred to another organization. Then compatibility, metadata, data documentation, licensing agreements and standards must be considered.

### 4.1.3 DoD 5012.02
This standard was published by the American Department of Defence in 2007, and has the full name Design Criteria Standard for Electronic Records Management Software Applications, but with the abbreviation DoD 5012.02. The two precursors were published in 1997 and 2002. It is a national standard that is adapted to the American laws and regulations, with the main purpose to be used by the American military departments for their records management. Even though it is a national standard it is used for guidance and certification outside of the US, both by governmental document management and by private companies. The standard contains in addition to mandatory and non-mandatory requirements a detailed section of the management of classified records, and a chapter of how records should be managed for the privacy act and the freedom of information act. According to Pontevolpe and Salza (2008) the standard describes the minimum requirements that an ERMS must meet based on the US National Archives and Records Administration (NARA) regulations. It has a testing process so that companies can certify themselves to the standard, either for only the core requirements or for the classified records requirements as well. According to Pontevolpe and Salza (2008) the requirements in the standard is complete and thorough and has relevant influence on commercial products.

The core features of DoD 5012.02 are presented below in the general and detailed requirements. This was made with information from Gables (2002) article about the 2002 version of DoD 5012 as well as the standard DoD 5012.02. The features that were deemed self-explanatory have no description, but the more complex ones do.

**General Requirements**
C2.1.1 Manage records regardless of storage media

C2.1.2 Accommodate four-digit dates

C2.1.3 Meta-tagging organizational data
This implies capability for adding Organization-Defined metadata fields, modifying field-labels and mapping data fields to standard transfer format fields.

C2.1.4. Backward compatibility to earlier product versions

C2.1.5. Accessibility
The ERMS should comply with Americans with Disabilities Act requirements, requirements about text-elements in web-based interfaces and follow standards of electronic and information technology accessibility. To follow the last point the ERMS must for example not use blinking objects and have a well-defined on-screen indication of the current focus.

C2.1.6. Extensibility
Capability to provide open standards interfaces to integrate the ERMS into the organizations’ information technology enterprise.

C2.1.7. Security Compliance
Applicable security standards shall be supported, including security technical implementation guidelines.

**Detailed Requirements**

C2.2.1. Implementing File Plans
A file plan is a document containing the identifying number, title, description and disposal authority of files used in an office. A record folder is a static structure or aggregate gathering of records. The standard specifies mandatory file plan components and mandatory record folder components. According to Gable (2002) records are classified into a folder hierarchy according to a uniform file plan. This classification process is described further under C2.2.3.

C2.2.2. Scheduling Records
Phases and actions related to a retention/archiving schedule. The disposal lifecycle should be possible to begin according to a time or an event or both.

C2.2.3. Declaring and Filing Records
The standard specifies mandatory metadata and authorization requirements to be able to associate attributes of a record folder with its containing record, as well as links between different records and folders. Every record should have a unique computer-generated record identifier and all the metadata about a record should be printable.

C2.2.4. Filing Electronic Mail Messages (E-Mail)
E-mails are to be treated the same as any other records.

C2.2.5 Filing Records to be Later Transferred or Accessioned to NARA
Additional metadata for records to be transferred or accessioned to NARA

1 The National Archives and Records Administration
C.2.2.5. Storing Records
The standard specifies repository requirements and requirements about the retrieval of documents from the repository.

C2.2.7 Retention and Vital Records Management: see requirements below

C2.2.6.1. Screening Records
To screen among the records or folders based on metadata and present the screening in columns selected by the user.

C2.2.6.2. Closing Record Folders
The closing of records folders to further filing, and adding of records to closed folders.

C2.2.6.3. Cutting Off Record Folders
To break or to end the records at regular intervals to permit from disposal or transfer in complete blocks. The cutoff begins by ending input to old files and starting the input to new ones.

C2.2.6.4. Freezing/Unfreezing Records
To extend or suspend the retention period for folders or records as well as metadata for the reason of suspension or extension.

C2.2.6.5. Transferring Records
Transitional transfer or accession of records or folders.

C2.2.6.6. Destroying Records
The deletion of records must be confirmed by authorized individuals.

C2.2.6.7. Cycling Vital Records
Cycling is the process of periodic replacement of obsolete copies of vital records with copies of current vital records in intervals determined by an authorized individual.

C2.2.6.8. Searching for and Retrieving Records
The records and the file plans should be possible to browse based on user access. Any combination of metadata or record category should be possibly to search for.

C2.2.7. Access Controls
Requirements about authorized individuals and what their roles and responsibilities are, as well as access rights for individuals and groups. The roles and responsibilities in the ERMS shall also be definable to fit the certain business purpose. The responsible record manager should be able to assign access rights.

C2.2.8 System Audits
The actions performed on records and files should be logged. These actions include retrieving, creating, deleting, searching and editing on entities in the ERMS.
C2.2.10 Product Combinations
If two products are combined where one product creates the records and another product performs the retention schedule tracking, they should follow some requirements. For example, naming conflicts should be avoided and metadata should be synchronized and the search should be possible in the same user interface even if more than one product manages the records.

C2.2.11 System Management Requirements
These requirements are provided by the operating system by database management system.

C2.2.12 Additional Baseline Requirements
Requirements that the company should follow, but do not necessarily have to be in the ERMS, for example e-mail.
4.2 Comparison of Core Features Between Standards

In this section a side by side comparison between the core features of the standards will be presented (Figure 6). To do this, MoReq2010 was chosen as the base for the comparison because it is the most detailed standard. The order of the core features of DoD 5012.02 were changed to fit MoReq2010 to make the table easier to read. Since the core features are already described to some detail in the previous chapter, only the similarities and differences will be described in this chapter.

Figure 6 – Visualization of comparison between standards. Core features of ISO 15489 and DoD 5012.02 were connected by similarity with the core features of MoReq2010. Circled features were deemed similar compared to the features of the other standards.
In Figure 6 the core features of the three standards are presented. Some core features in MoReq2010 or ISO 15489 were deemed to be interconnected when compared to the core features in the other standards, which is visualized by circles in the figure. The lines represent a similarity between the core features of MoReq2010 and those of ISO 15489 and DoD 5012.02. The lines do not mean that they are completely equivalent, but that they have some kind of similar qualities. The core features of DoD 5012.02 are treated a bit different than the core features of the other standards because of the different detail level of them compared to the detail level of the other standards. Therefore when the core features of DoD 5012.02 are grouped together it means that they are related to a specific core feature in MoReq2010, but it does not necessarily mean that they are interrelated. The level of similarity between the core features of the standards will be explained below.

User and Group Service
What MoReq2010 calls a user and group service is not mentioned in either ISO 15489 or DoD 5012.02, but they all write about management of users. Both of the other standards mention access and security according to groups or users under the headlines Access Controls in DoD 5012.02 and under Access and security classification and Use and tracking in ISO 15489. The groups mentioned in ISO 15489 are business units, while MoReq2010 is more specific and suggests a separated service for the management of users and groups, with specific requirements related to that function. The access chapters in the other standards are more related to the model role service below.

Model Role Service.
In MoReq2010, this is where the users get their access, which means that they answer to the same core features in ISO 15489 and DoD 5012.02 as the user and group service in MoReq2010 does. Access in ISO 15489 has more of a legal focus, but the descriptions are similar, and both ISO 15489 and MoReq2010 describes that records should only be accessible to users or groups that are granted access. In DoDS012.02, who gets access to what, is mentioned under many of the other core features where it says that only authorized individuals are allowed to perform certain actions.

Classification Service
This is a feature that all of the standards find important and puts emphasis on. The Classification feature in MoReq2010 answers to classification and access & security classification in ISO 15489, and Implementing File Plans and Declaring and Filing Records in DoD 5012.02. The purpose of classification is according to MoReq2010 for the records to be connected to a business context. According to MoReq2010 the classes represent business functions, activities and transactions. In DoD 5012.02 the term class is not used, but rather used for secret records. The standard does however mention connecting records to other records and to the correct business context. This is done by record categories and through the file plans and record folders.

After having read the three standards, two parts of the concept of classifications can be derived. It is classification in general which means that every record must be related to a business activity. This is done either by a classification to each record or to the containing
folder, or through the aggregation system. This system is called files in ISO 15489 and Record Folders in DoD 5012.02. The aggregations have the purpose of further classifying the records and grouping them into their correct context. ISO 15489 mentions a hierarchical classification representing the business process at three levels of that reflects an analytical process. The first level reflects the business function, the second level is based on the activities constituting the function and the third level is further refinements of the activities or groups of transactions that take place within each activity. Only MoReq2010 and DoD 5012.02 write about the importance of being able to edit the class of a record.

MoReq2010 recommend a hierarchical classification which the other standards are not mentioning. Also MoReq2010 is the only standard that puts importance on classifying aggregations as well. DoD 5012.02 are more looking at the aggregations as a form of classification for the records.

**Record Service**
This feature in MoReq2010 address the use and functions of aggregations. This is not formulated as a core feature in the other standards, but aggregations are mentioned in them as well. The difference is that MoReq2010 is clear on the point that it should not be possible to have records at the same level as aggregations, that aggregations should have an assigned class. This is not very clear in ISO 15489:2 (2001, p. 16) where it only says that “grouping them [the records], if applicable, into files to facilitate description, control, links and determination of disposition and access status”. DoD 5012.02 is also not as clear on that point but says that it should be possible to associate attributes of a record folder with its containing record, and view the aggregations as a way to classify and group the records. What is mentioned in both MoReq2010 and DoD5012.02 is that aggregations should be classified as well, which in DoD 5012.02 is written in the form of associating attributes of a record folder to a record.

**Metadata Service**
Metadata service is formulated as a separated service in MoReq2010 because of the interoperability it gives and the importance of correct metadata. In the other standards, metadata is something that is created at almost every other core feature, which makes it hard to draw exact comparisons between the standards. Generally, they all find it important with thorough information about every record as well as other entities regarding their creation, management and disposal.

**Disposal Scheduling Service & Disposal Hold service**
Disposal scheduling service and disposal hold service is connected to Identification of disposition status, Storage and Implementation of disposition in ISO 15489 and to Scheduling Records, Storing records and Retention & Vital Records Management in DoD 5012.02. Scheduling Records in DoD 5012.02 deals with the retention schedule of record categories, which the Disposal & Scheduling service in MoReq2010 deals with as well. ISO15489 and DoD 5012.02 mentions triggering actions for disposal and the fact that disposals can be triggered by dates or events. According to all three standards it should be possible (but not necessary) to retain a record for an unlimited time. The biggest difference is the emphasis that
MoReq2010 puts on the fact that metadata about the record should always be saved, even though the actual document is destroyed. This is not mentioned in the other standards. To have the disposal as an automated service is mentioned in all three standards.

**Search & Report service**
The search and report service part in MoReq2010 answers to a small part of Storage in ISO 15489 and some parts of Storing records and Retention & Vital records management in DoD 5012.02. In ISO 15489:2 (2001, p. 18) it says “Electronic records may be stored in a variety of ways that make their retrieval easier or faster”. This is the only mention of searching for stored records in that standard. DoD 5012.02 and MoReq2010 are on the same page in that it should be possible to search for records based on related entities, or have a separate search query. They also agree on that the search results should be presented in multiple ways chosen by the user.

**Export Service**
The export service in MoReq2010 has the purpose of bringing entities from one ERMS to another system without losing any data or the business context. The other two standards are not as clear on that fact and do not have any equivalent requirements. What Export service essentially means is to have an adequate amount of XML data to be able to export records in a correct way without losing any data. This is described in both of the other standards, but not for the purpose of export, which is the reason that export stands alone without any connections to the other standards in figure 6.

**Further comments**
At the bottom of figure 6 the core features from DoD 5012.02 that do not have a clear connection to any of the core features in MoReq2010 are listed. Some of them figure in the non-mandatory features of MoReq, for example accessibility.

At the bottom of figure 6 is also System Audits in DoD 5012.02 tied directly to Use & tracking in ISO 15489. That is because MoReq2010 does not have a core feature that answers to those meanings, but rather have event histories as an important part of the introduction. In all of the standards it refers to the fact that usage of records should be logged in an event history. The usage could for example be retrieving, creating, deleting, searching or editing actions according to the DoD 5012.02.

**Summary**
The conclusion of the comparison is that the standards generally support each other on which the important features are that an ERMS should satisfy. What interfered was mostly the level of detail and the emphasis on exporting in the case of MoReq2010. The core feature with the biggest differences was the one about classification, where ISO 15489 suggests three levels, MoReq2010 a hierarchy of three or more levels and DoD5012.02 do not use classification in the same way as the other standards.
4.3 Standards and Evaluation of the ERMS

There are a few problems with IFS DocMan that were already experienced by the application consultants at IFS which was discussed during an interview (Österlund, 2012). One was that a class that is connected to an object cannot be changed because it is part of the document key. The other identified problem was that there is no archiving function in the system, except for the “date obsolete”, “days to expiration” and “remaining days” fields. These identified problems will be viewed from the point of view of the standards, as well as other differences between the standards and IFS DocMan.

The identified differences are at a general level. The standards will be seen as unified in this section since they support each other on most of the core features, except for when one standard is saying something particular about something in particular.

User and group service / Model Role service
IFS DocMan has a working user and group service, where every user and group gets access to the right documents. Therefore it follows the standards basic requirements for both users and groups, as well as the access requirements.

Classification Service
The concept of classification is not featured in IFS DocMan in the same way as in the standards. The purpose is the same as the standards, which is to give the document a business context, but the definition is slightly different. In the application, records are assigned a class when created. That class is together with the document number, sheet and revision the document key. Since the class is a part of the document key within IFS DocMan, none of these four elements are editable. Therefore an already existing document that needs to get a new class for some reason cannot get that, and a new document needs to be created instead. The standards are instead suggesting a technical key.

The definitions also differ. What the standards are calling class (business functions, activities and transactions) is more alike the business objects of IFS DocMan. They can be for example a project, work order, invoice, supplier, engineering part et cetera. This is more similar to the standards’ definitions about classes, but without the hierarchical structure, than IFS DocMan classes are. The IFS DocMan classes are more connected to record type and can be for example invoice, 3D-drawing or project plan.

Further the classes in IFS DocMan only have one level, and not the three levels that ISO 15489 suggests, or the classification at multiple levels suggested in MoReq2010.

Another difference in classification is that classes are not inheritable through aggregations, which is a requirement in both MoReq2010 and DoD5012.02.

Record Service
The concept of aggregations is described as a key feature in MoReq2010 as a part of the record service. It is possible to create aggregations in IFS DocMan, but since there is a possibility to have records at the same level as other aggregations, they do not comply with MoReq2010. It is also possible to create records outside of the aggregations, to have the same
Another way in which the folder-system in IFS DocMan differs from those in the standards is that aggregations in IFS DocMan do not have as much metadata as the standards would suggest, with classes and disposal schedules tied to the aggregations in the same way as to the records. It is also not possible in IFS DocMan to inherit attributes such as disposal schedules and classes through the aggregations, directly to their children or containing records, which the standards suggest. What MoReq2010 writes however is that “This approach to classification by inheritance is recommended for managing large numbers of records as it avoids the need to individually classify each record. However, it is only possible where the records contained within a particular aggregation are homogenous.” (The DLM Forum, 2011, p. 69). Therefore every record within an aggregation needs to be homogenous for the inheritance of classes, disposal schedule and other metadata to be beneficial, which they are not in IFS DocMan.

**Disposal schedule / Disposal Hold**

In IFS DocMan the disposal schedule is represented by the field “date obsolete” (Figure 7), and by two fields for “days to expiration” and “remaining days”. The disposal is set manually or automatically through the class. The actual disposal of a record must be done by external scripts or manually. This does not conform to the standards, that all puts a larger emphasis on the disposal of records, and suggest more metadata related to disposal. The metadata should describe how long the record should be contained and how it is supposed to be disposed at the end of the retention period, as well as trigger events and disposal holds.

![Figure 7 - Disposal in IFS DocMan](image-url)
Search & Report Service
IFS DocMan has a customizable search function where it is possible to search according to title, object, folder, class or any other metadata connected to a record. It is also possible to search for folders or objects and look for related entities. What is not possible is to view a full tree of the aggregations since it is possible to have an unlimited amount of root aggregations in IFS DocMan, with no connections to the other aggregations. What is possible is to populate all the aggregations, which are presented in a list with no connecting tree structure. The sorting of the list of aggregations can be edited by the user.

Export Service
IFS DocMan have a system for importing and exporting documents and metadata, which is mainly used for drawing. In that system the drawings are translated into XML-format.

Event Histories
IFS DocMan supports event histories in the history bar visible to the left in figure 7. There it is possible to view checked in and checked out records, access, approvals, connected and disconnected objects, information change, status change et cetera. To be able to see when a record is merely searched for or looked at has so far not been a desired function and is therefore not in the system.

Function not Mentioned in the Standards
Connections to Business Objects is something that figures in IFS DocMan but has no place in the standards for document management. The purpose of business objects is similar to the purpose of classes in the standards, to give the record a business context. It is freer than the classes though, but they are treated differently. The objects can have cross-connections between each other and relevant records, while classes are seen as a hierarchical structure, even though they both refer to business functions. This is viewed as a valuable function in the system.
5. Discussion

In this section differences between standards and the differences between the standards and IFS DocMan will be discussed and a suggestion for changes in IFS DocMan will be made. After that the method used will be discussed, and standards in general will be addressed.

5.1 Comparison of Core Features between Standards
The comparison implies that MoReq2010 is more detailed than the other standards in most aspects, which has its explanations in the purpose and scope of the standard compared to the others. It is also important to remember that ISO 15489 was from 2001 and DoD 5012.02 was from 2007, so MoReq2010 is the most recent standard of the three. Since their scopes are different, some differences are natural. MoReq2010 has the focus of interoperability that none of the other standards mention, which is apparent in the core feature export service. ISO 15489 is written for both electronic and physical documents, which makes the focus of the requirements different. An example of this is that ISO 15489 writes about archiving with a focus on physical records, which have other space-requirement than digital records.

The comparison also implies that the standards take up many of the same aspects, only with details separating them. This would mean that there are certain factors that are of importance within the field of document management, which standards in the field address.

5.2 Differences between the standards and IFS DocMan
The differences between the standards and IFS DocMan that are addressed in the discussion are the technical key, the aggregations, the disposal service and what is in IFS DocMan but not in the standards. The features that differ most from the standards are presented in Table 3, with the pros and cons of them inspired by the functionality of IFS DocMan. These will be described further in the text.
<table>
<thead>
<tr>
<th>Functionality</th>
<th>Pros when relying on standards</th>
<th>Cons when relying on standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Document Keys</td>
<td>- Flexibility with changeable classes</td>
<td>- Says nothing about the record when seeing only the key</td>
</tr>
<tr>
<td>Classification at more than one level</td>
<td>- Clearer context for the records.</td>
<td>- More for the user to fill in</td>
</tr>
<tr>
<td>Aggregation</td>
<td>- Overview</td>
<td>- Restricted with no records at the same level as aggregations</td>
</tr>
<tr>
<td></td>
<td>- Possible to search easily through the aggregations</td>
<td>- No records outside of the aggregations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The aggregations will become so many that overview is impossible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Impossible with the same record in more than one aggregation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(they suggest copies)</td>
</tr>
<tr>
<td>Inheritance through aggregations</td>
<td>- Less for the user to fill in</td>
<td>- Only for homogenous records within the aggregations</td>
</tr>
<tr>
<td></td>
<td>- Less risk for classification mistakes since it is automatic</td>
<td>- Hard if the ERMS do not have aggregations as the standards suggest</td>
</tr>
<tr>
<td>Disposal Service</td>
<td>- Clear disposal plan for every record</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Automatic disposal</td>
<td></td>
</tr>
</tbody>
</table>

**Technical keys**

The advantage of having a technical key is more flexibility with changeable classes. The disadvantage of a technical key is that it says nothing about the record when you look at the key, which creates issues at a technical level and may worsen the performance when the key needs to be converted to the actual document to see the contents. Another disadvantage of a technical key is that the whole ERP IFS Applications (with some exceptions) is built up of attributes from business entities creating keys. Therefore it would create difficulties to have separate keys for documents in IFS DocMan.

**Aggregations**

The concept and functionality of aggregations answers to the usability heuristic of Recognition rather than recall by Nielsen (2005) that is described in the theoretical framework in that the user can follow the structure of the aggregation rather than remembering the name of every record. The advantages of this is that documents at a higher level can be put at the same level as aggregations without a problem, and that records that do not have a clear connection to other aggregations or records still have a place in the system.

MoReq2010 recommend only records at the lowest level with no records at the same level as aggregations. The advantage of this is that it makes it visible for the user. The disadvantage of the type of aggregations MoReq2010 suggests is that it becomes more restricted when records only can be at the lowest level.
Something that is an advantage in IFS DocMan but not mentioned in the standards is that the same records can have a place in more than one folder. This is seen as valuable because one record can be useful to, for example, more than one project. According to the DLM Forum (2011), the way to solve this is to create duplicates. The problems with duplicates though are that they demand disk space, and that it creates unnecessarily many versions of a record. A good solution would be to connect the same record to several aggregations, which is how it works in IFS DocMan. The problem with this solution is that it creates an issue for the inheritance that the standards recommend, since a record only can have one class and one disposal schedule, but will inherit that from different aggregations if it were to follow the standards. What is mentioned though is that the records need to be homogenous for inheritance through aggregations to work. In IFS DocMan the records within the aggregations are homogenous which is practical for business purposes. Therefore no inheritance through aggregations is advised, as well as no suggestion for having it mandatory to put records in aggregations. It would not give a better overview and clearer search since the system is so complex and contains so many records that it is not advisable to search through a navigator of aggregations when looking for records.

**Disposal Service**
How the disposal should work differs largely from business to business. In some companies the records should be kept forever, and in others to be disposed of as soon as possible to not be used as evidence. Therefore there is need for a flexible disposal function in the system. The standards suggest a flexible disposal service with different triggers and possibilities.

**5.3 Suggestions for Changes in IFS DocMan**
Based on the standards there are a number of changes that could be done in IFS DocMan. In this part some suggestions of changes will be done based on the standards and on subjective opinions of which parts of the system would be the best to develop. The changes at a structural level are visualized in figure 8 and described in the following text along with more detailed suggestions.
Figure 8 – Visualization of suggestion for structural changes in IFS DocMan. The elements marked in red differ from the current version of IFS DocMan. They are the document key, classes at three levels and a connection between document folders and business objects.

**Document Key**
To make the classes changeable and to bring a larger flexibility to the documents, the document keys could be changed to technical keys instead of having class, number, sheet and revision as the key. This is represented by “Unique UUID” in figure 8.

**Classification**
When the classification is brought out of the document key, some changes could be done to the classification system as well. Instead of having only one level of class, it could be classes with one or two sub classes depending on the business. These classes could mean what is written in ISO 15489 – three levels where the first represents the business function, the second activities and the third refinements of activities and transactions (see to the right in figure 8). Every record in IFS DocMan would then have to have two or three classes in a fashion similar to: “class level 1”, “class level 2” and “class level 3”. When the classes are brought out of the document key they are possible to change after a record is created, which is beneficial. It could also be possible to remove unused classes. Today some attributes are tied to the classes, like disposal and templates. This inheritability through classes is something that is beneficial to keep and can be of attributes already tied to the classes, or further attributes that may be asked for.

If more levels of classes are added, it causes some issues to be dealt with:

1. The user have two more mandatory fields to fill in, which requires more clicks
2. Relationships between the classes would have to be described
3. How to handle the class-specific values managed when the class is changed
To solve the first issue, the last class used by a user could be automatically generated when a user wants to create a new document. The reason for this is that most users create documents from very few classes, so if this had an automatic possibility, then it would make it easier for the user in many cases which would serve the usability and make the user search through fewer entities before finding the right one.

To solve the second issue every class could get a parent and/or child class as described by MoReq2010, which could be visualized in a hierarchical structure. Therefore, to solve the second issue, and to also conform to the recognition heuristic within usability described in the theoretical background, a new Document Class Navigator could be introduced to make the class relationships and functions clear to the user. This would be similar to the Document Folder Navigator in the system, and be an addition to the Document Class Manager (figure 2). The purpose of this navigator would be for the user to view and search the classes in a structure, and to see which features they have. The current page for document class is below in figure 9 and the new suggested page for class navigation with three related classes is in figure 10.

Figure 9 – Current page for information about Document Class

![Figure 9](image1)

Figure 10 – Suggestion for new Document Class Navigator. The relationships between the different class levels are visualized in the hierarchical structure to the left. To the right are information about the class, and the other levels of classes. The darker field shows the selected class.

The Document Class navigator could be reached when searching for the information that is connected to the class. This information could be what is suggested in figure 10 – parent and child classes, revision layout and disposal. The disposal function and revision layout will be described below. What is possible to override can be decided from business to business. The purpose of the Document Class Navigator will mainly be information for the novice user.
Most users will assign two or three levels of classes to a record, and get the included disposal schedule and revision layout automatically without checking it up in the Document Class Navigator.

The third issue of how to handle the class-specific values when the class is changed is a challenge. Generally the disposal schedule and every other attribute given to the record through its class, is also tied to that class. Therefore when a class is changed, the attributes of the new class should apply to the record according to the standards. This creates a problem if attributes from one class does not exist in the new class. Should the user get warned and the attributes disappear, should the differing attributes be invisibly stored in the database, or should the differing attribute remain? The suggestion to solve this problem is to have a certain procedure in shape of a dialog box for changing the class (figure 11). In this procedure the user can choose if the differing attributes should be kept or discarded. If it is decided that the attributes should be kept, they are stored along with information about the old class under “history”. This procedure would follow the heuristic of visibility of system status, where the user should always be informed through appropriate feedback.

Figure 11 – Suggestion for dialogue for differing attributes when changing class

**Revision Layout**
Revision layout was described in the introduction as the layout the user can see when adding a new record. To follow the aesthetic and minimalist design heuristic by Nielsen (2005), only the relevant information should be visible. Irrelevant or rarely needed in a dialogs should therefore be hidden. To conform to that heuristic it is possible to add a “revision layout” function that is inheritable to the records through the classes. This function would mean that what metadata fields the user can view and edit are connected to the class, which means that they do not need to see the metadata fields rarely used when creating a record of a certain class. This is not something that is mentioned in the core features of the standards, but rather relates to usability.

**Disposal**
To make the disposal follow the standards more, the suggestion would be more metadata for disposal. This could be in form of a separate disposal-tab, instead of having the disposal information under general.
The additional metadata could for example be what is suggested below in figure 12. There the disposal is triggered by a time that is formulated as year, month and day beginning from a certain event that can be chosen from a dropdown list. Those events could for example be date of last revision, the originating date of the record, last time record was edited or other values that is configurable depending on the business. When that time is reached, one of four actions will occur, which has to be chosen. At the bottom of figure 12 is information that states when the disposal triggering event or time occurred and how long is left until the action will be carried out.

![Disposal tab in IFS DocMan](image)

**Figure 12 – Suggestion for new disposal tab in IFS DocMan**

It is possible to add more metadata related to disposal under the disposal tab, for example a disposal hold function or further metadata elements related to actions or triggers. Figure 12 is a first draft of the additional disposal function. The information under the disposal tab could be automatically filled in for the normal user and only made possible to override by authorized individuals.

**Connecting Objects to Aggregations**

Today the objects can only be tied to preprogrammed objects, records or other entities except for aggregations. It would be beneficial to have the possibility to tie objects to aggregations as well, which will give them a business context too, which would bring the functionality closer to what is suggested by the standards, where aggregations have business context through the classes. This is visualized by the additional line between document folders and business objects in figure 8.

**5.4 Method Discussion**

The method used in this thesis for comparing standards was to compare them feature by feature at a not so detailed level because of their length and complexity. Thereafter they were applied to a real system - IFS DocMan. This method was chosen for convenient purposes, and because it was an assignment from IFS. Another way to look at standards for document management would have been to compare more

**The Standards**

The advantage of that method was that more than one standard was looked into, and the field of document standards with their different approaches was more thoroughly examined than if
only one standard would have been chosen. The drawback was that their differences may have created some confusion to the terms within them, and the system evaluated after the standards did not get a completely clear answer to system changes. If only one standard was chosen the evaluation of the system would have been more thorough. But since the aim of this thesis was to find the core features of the most influential standards the level of detail was within the scope of the thesis.

The choice of having MoReq2010 as the main standard for the comparison was because of its detail level and the subjective opinion that it had the most logical division of core features. The possibility would have been to create own categories and to compare the standards from those categories. The risk when doing that would have been that it would become confusing and hard to read if an additional division of features.

**The Comparison**

The comparison between the three standards was done by taking MoReq2010 as the base and comparing the other standards’ core features to those of MoReq2010. The advantage of this approach was that the standards were put in focus and that the visualization was easy to comprehend. It was also the approach preferred by IFS. Another method would have been to come up with new categories to fit the core requirements of all three standards. This method was not chosen because it could have created further terminological confusion.

**The Case Study**

In this thesis IFS DocMan was seen as a case to view how standards can be used to evaluate an already existing ERMS. In this thesis no particular method or research process of conducting a case study as suggested by Runeson and Höst (2008) was used. The reason for this was that no actual changes to IFS DocMan were done and tested. Since that was not in the scope of this thesis, it went more to the explanatory direction. Therefore the improvement was not actually carried out, rather suggested. Nonetheless the method can be seen as a case study since a phenomenon (standards for document management) was investigated in their context (an ERMS). The advantage of having a real ERMS to evaluate when comparing the standards was that the issues became real, and it became easier to see which parts of the standards that was important to focus, as well as the detail level to study them on. This matches the advantages described by Runeson and Höst (2009) for doing a case study. A disadvantage may have been that the features in the standards were looked at from the perspective of the functionality within the application. This may have resulted in one-sided analysis where some features were overlooked for importance, which would have been seen as important with another approach, or another ERMS.

**Validity**

The study could be viewed as having a high internal validity since it evaluated what it is supposed to evaluate, namely changes that could be done to a system when looking at standards. The conclusions that are drawn in the context are trustworthy, though the general level of the evaluation might imply there are additional aspects at a more detailed level not considered. The use of three standards, each one with slightly different focus of attention, can also be considered to increase the internal validity.
There is a certain aspect of external validity since the results could be valuable for other companies within the same industry. It is a summary of the standards they could use and gives them a quick overview of the three used in this thesis. It also gives a suggestion of which core features of the standards are most worth looking into. The drawback is that a specific system was evaluated and has been the base when using the standards; therefore the result is highly adapted to that system and might not be representative to other systems. Another possibility would have been to look at more than one ERMS and to do a comparison between them instead, and have fewer standards to do so. This would have given a better external validity, but would have been more difficult to accomplish because then more systems would have needed to be familiarized.

**Reliability**
The Reliability is about the accuracy of the study, and what would have happened if for example someone else would have conducted it. If that would have been the case, other aspects may have been found essential. What would probably have been the same are the detail level and the focus on the core features because of the time constraint and the structure of the standards. What could have been done was interviewing users to get a broader view on the system and hear their problems and compare it to the suggestions of the standards. Finally, the recommendations can be further discussed involving more of the end-users of the system. Recommendations given in this thesis will nevertheless hopefully serve as a good starting point for such a discussion.

### 5.5 The Use of Standards

After having used the standards to evaluate IFS DocMan, it is possible to answer the third question in this thesis which was “What are the biggest challenges when using influential standards for document management in the development of an existing Electronic Records Management System?”

One of the main difficulties when applying standards when evaluating an already existing ERMS was the terminological differences. From an ontological viewpoint the domain of record management should have a shared set of terms and functionalities, but these differ in various ways. The creators of the ERMS have already created a set of terms within the ERMS that sometimes have the same names as the terms in the standards, but can refer to something slightly different. The same goes for the different standards that use the same terms for different things. The difficulty then lies in translating the terms of the standards to those of the ERMS and vice versa. This can be a time consuming process. An example of this was the meaning and function of objects in IFS DocMan and the meaning and function of classes in the different standards. Apart from terminological differences there were sometimes differences in functionality, for example with aggregations and classification. What became clear when suggesting changes for the system was that a complete use of standards would have resulted in a less usable system. This means that the requirements from the standards always should be read from the users’ and the systems’ viewpoint.
Another difficulty is the openness. The standards need to be open to some interpretation to be able to work in different business settings and to make it possible to create different ERMSs that still follow the standards. This creates an element of interpretation for the user of the standards that is positive in that it makes different solution fitting a specific business still follow the standards. It can also create certain confusion when they do not present any clear examples of the requirements to be able to keep that openness.

A third challenge when using standards is their sheer size. It is hard to get an overview of them and it can take longer time to implement the standards than is profitable for the company behind the ERMS. They also cover so many use-cases that it can become too much for the user if every requirement was followed in the ERMS. This is verified by Christensen (2009) who writes that the standards bring multiple features, which can overwhelm the users by the complex functionality. This means that following every feature in the standards may bring multiple functionalities to the system, but it may also bring down the overview and the usability. Österlund (2012) also confirms this when classifying records in earlier versions of IFS DocMan according to standards. The solution suggested by the standards lead to three levels of classes, where most records fell under the same first level class. The solution was to remove that level of class to make it easier for the user.

MoReq2010 mentions usability under the non-functional requirements, which makes it out of scope for this thesis, but it might still be worth mentioning. The usability is an important aspect when creating an ERMS and needs to be taken into account for the ERMS to be liked by the user.

In addition to the length of the standards, they are not so easy to use. It is apparent that MoReq2010 have been worked with for easy interpretation, and to bring a clear understanding to the reader. The other two standards can be perceived as not equally easily interpreted, with less logical divisions of the core features and the other parts.

In spite of the difficulties when using standards for document management when evaluating an existing ERMS, the recommendation would still be to use standards. They present valid points related to interoperability and gives guidance and recommendations for every part within an ERMS. They can be used in full to get certifications, or they can be used as guidelines for the structure of the ERMS. This is entirely up to the company using the standards, which have to decide themselves to what degree they need to follow the standards to create a functional, usable ERMS.

5.6 Generalization

ERMSs are complex systems with a large amount of functions and relations. To develop an existing ERMS it is a good choice to look at standards for document management to get inspiration and guidance for improvements that could be done to the systems. Standards are a valuable resource when developing or creating an ERMS, but their size, complexity and terminological differences leads to difficulties. Still they provide a large amount of information regarding record management that is valuable when creating an ERMS.
After having used standards in the context of developing an ERMS there are some things that can be said about using standards in general, both for developing systems and for creating new systems.

To have a standard within a certain domain is beneficial to make the industry follow the same direction and to create interoperability within the industry. It is valuable to look into standards within that domain to get inspiration and pointers for the development of the system. When using standards it is important to first read the introductions carefully to understand the scope and purpose of that certain standard, and then to decide to what extent the standard is to be used when developing the system. The extent could be everything from inspiration to full certification according to that standard. To decide the extent an evaluation of how a certification would benefit the system and the company and what it would mean for the product can be done. What the designers always needs to have in mind when using the standards is the user.
6. Conclusion

The standards for Document Management compared in this thesis were MoReq2010, ISO 15489 and DoD 5012.02. Their core features are listed in the result, and are given connections to the core features of MoReq2010 from all three standards. Those core features were user & group, model role, classification, record, metadata, disposal schedule and hold, searching & reporting and export. The core features from the three standards were perceived as generally supporting each other on which the important features are that an ERMS should satisfy. Important core feature that interfered between the standards were the views on classification and inheritance. These two factors should be extra looked into when developing or creating an ERMS, as well as also taking into account the purpose for creating the ERMS and its intended users.

When the standards were used to evaluate IFS DocMan, some changes could be suggested to the system. These changes were to change the document key into a technical one, to introduce changeable classes at more than one level and connections between folders and business objects to provide a business context. A change that is suggested that relates to usability is the revision layout, where the user sees only the metadata fields that are connected to the current class. After having used three standards to evaluate an ERMS, it can be said that it is generally a good choice to look at standards for document management for inspiration and guidance when developing or creating an ERMS for inspiration and guidance. The major challenges when using a standard are their size, complexity and focus which may differ from the focus of the system in question.

Further Research

To investigate the field of document standards further, one standard could be chosen as the base instead of three to get a more detailed analysis of the ERMS used in this thesis, or of some other ERMS. What would also be interesting is the importance of the non-mandatory features in the different standards, and to do research based on those. To continue the research with IFS DocMan, it would be interesting to see the design suggestions from this thesis implemented and tested.
References

Printed Sources


Gable, J (2002), Everything you wanted to know about DoD 5015.2. Information Management Journal.

Heim (2007), The resonant interface: HCI foundations for interaction design. Boston, Addison Wesley


Jonsson, J (2004), Ontologibaserat dokumenthanteringssystem implementerad som datakatalog i legacymiljö. Masterthesis for the institution for communication and information, Skövde
Pontevolpe, G & Salza, S (2008) Archiving and preserving e-mail


**Internet Sources**
International Organization for Standardization homepage: [http://www.iso.org/iso/about.htm](http://www.iso.org/iso/about.htm), [Visited 15 March 2012]

MoReq2 homepage: [http://www.moreq2.eu/other-specifications](http://www.moreq2.eu/other-specifications) [Visited 20 February 2012]


**Interviews**
Appendix - Non-mandatory Requirements

DoD 5012.02

C6.1. REQUIREMENTS DEFINED BY THE ACQUIRING OR USING ACTIVITY
C6.1.1. Storage Availability.
C6.1.2. Documentation.
C6.1.3. System Performance
C6.1.5. Operating System Environment.

C6.2. OTHER USEFUL RMA FEATURES
C6.2.1. Making Global Changes
C6.2.2. Bulk Loading Capability
C6.2.2.1. An Agency's pre-existing file plan.
C6.2.2.2. Electronic records.
C6.2.2.3. Record metadata.
C6.2.3. Interfaces to Other Software Applications.
C6.2.5. On-Line Help
C6.2.7. Fax Integration Tools.
C6.2.8.1. File and correspondence tracking to positions, sections, or staff members.
C6.2.8.2. Creating, printing, and reading labels for non-electronic records.
C6.2.8.3. Boxing records for transfer.
C6.2.8.4. Box tracking for records-holding facility operations.
C6.2.8.5. Workflow tracking.
C6.2.8.6. Posting changes in disposition.
C6.2.8.7. Recording audit and census functions.
C6.2.9. Retrieval Assistance.
C6.2.11. Workflow and/or Document Management Features.
C6.2.12. Records Management Forms and Other Forms
C6.2.13. Printed Labels.
C6.2.15. Web Capability
C6.2.16. Government Information Locator Service (GILS).
C6.2.18. Organizational Customization

C6.3. SEARCH AND DISCOVERY INTEROPERABILITY
C6.3.1. Service-Oriented Discovery

C6.4. ACCESS CONTROL

MoReq 2010

performance,
scalability,
manageability,
portability,
security,
privacy,
usability,
accessibility,
availability,
reliability,
recoverability,
maintainability,
supported,
warranted,
compliance.
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