A Maturity Model for Information Governance

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ABSTRACT

Information Governance (IG) as defined by Gartner is the "specification of decision rights and an accountability framework to encourage desirable behavior in the valuation, creation, storage, use, archival and deletion of information. Includes the processes, roles, standards and metrics that ensure the effective and efficient use of information in enabling an organization to achieve its goals".

Organizations that wish to comply with IG best practices, can seek support on the existing best practices, standards and other relevant references not only in the core domain but also in relevant peripheral domains. Thus, despite the existence of these references, organizations still are unable, in many scenarios, to determine in a straightforward manner two fundamental business-related concerns: (1) to which extent do their current processes comply with such standards; and, if not, (2) which goals do they need to achieve in order to be compliant.

In this paper, we present how to create an IG maturity model based on existing reference documents. The process is based on existing maturity model development methods. These methods allow for a systematic approach to maturity model development backed up by a well-known and proved scientific research method called Design Science Research. We will focus on ISO16363 for the development of this maturity model.

Categories and Subject Descriptors

K.6.0 [**Management of computing and information systems**]: General - Economics

General Terms

Management, Measurement, Performance, Design.

Keywords

Information Governance, Maturity Model.

1. INTRODUCTION

A maturity model defines a pathway of improvement for organizational aspects and is classified by a maturity level. The maturity levels often range from zero to five, where zero consists on the lack of maturity and five consists of a fully mature and self-optimizing process. Maturity models can be used for assessing and/or achieving compliance since they allow the measurement of a maturity level and, by identifying the gap between the current and pursued level, allow the planning of efforts, priorities and objectives in order to achieve the goals proposed.

The use of maturity models is widely used and accepted, both in the industry and the academia [2]. There are numerous maturity models, virtually one for each of the most trending topics in such areas as Information Technology or Management. Maturity Models are widely used and accepted because of their simplicity and effectiveness. They depict the current maturity level of a specific aspect of the organization, for example IT, Outsourcing or Project Management, in a meaningful way, so that stakeholders can clearly identify strengths and improvement points and prioritize what they can do in order to reach higher maturity levels, showing the outcomes that will result from that effort which enables stakeholders to decide if the outcomes justify the effort needed to go to higher levels and results in a better business and budget planning.

The remaining of this paper is structured as follows: Section 2 presents the related work that can influence the development of the maturity model, Section 3 presents the development strategy for the maturity model as well as a first example of the maturity model based on the ISO16363 and based on the levels from SEI CMMI [3]. Section 4 presents the conclusions of this paper. The maturity model presented here is being developed in the context of the E-ARK[1] project.

2. RELATED WORK

2.1 Maturity Model Development Method

There are various examples of maturity models developed for the information management and records management areas, as shown in Section 3.2.

However, many of these maturity models have been developed in an ad hoc way, with no regard for detailed documentation of development, comparison with other models and even without following a certain process based on best practices from previous maturity model development efforts.

One example of such method is presented in [1], which is backed by a Design Science Research (DSR) method [4], making it useful both for the industry and the academia. This method is founded in eight requirements (R1 – R8) [1]:

1. R1 – **A Comparison with existing maturity models** is presented and clearly argues for the need of a new model or the adaptation of an existing one;
2. R2 – **Iterative Procedures** are followed to ensure a feedback loop and refinement;
3. R3 – The principles, quality and effectiveness behind the design and development effort of a maturity model should pass through an iterative **Evaluation** step;
4. R4 – The design and development of maturity models should follow a **Multi-methodological Procedure** which use must be well founded;
5. R5 – During the development of a maturity model there should be a clear **Identification of Problem Relevance** so that the problem solution can be relevant to practitioners and researchers;
6. R6 – **Problem Definition** should include the application domain for the maturity model and also detail the intended benefits and constraints of application;

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[1] http://www.eark-project.com

7. R7 – There should be a **Targeted Presentation of Results** regarding the users' needs and application constraints;

8. R8 – The design of a maturity model must include **Scientific Documentation**, which details the whole process design for each step of the process, as well as, the methods applied, people involved and the obtained results.

The well-argued claim of these authors is that these fundamental requirements should drive the development of every maturity model. Apart from evaluating well-known models according to these dimensions, the authors also delineate a set of steps to correctly develop a maturity model. It depicts which documentation should result from each step, and includes an iterative maturity model development method that proposes that each iteration of the maturity model should be implemented and validated before going to a new iteration.

2.2 Maturity Models

This section presents the several maturity models from the Information Management, Records Management and Information Governance domains that can influence the development of the maturity model proposed in this paper. Each Maturity Model is presented starting with a small description of the model, the aim of the model, scope, attributes and levels. These attributes further detail the maturity model by decomposing certain aspects of the maturity model domain. Some of the attributes being used are sections or principles. Although there are other attributes being used, such as, dimensions.

2.2.1 Asset Management Maturity Model

The Asset Management Maturity Model is originated from an evaluation in the Netherlands to investigate how asset managers deal with long-term investment decisions [5]. This evaluation took into consideration organizations that control infrastructures, such as, networks, roads and waterways and focus on the strategy, tools, environment and resources.

In detail:

- **Aim:** Understand how asset managers deal with long-term investment decisions and provide an improvement path for organization to improve the long-term investment decisions.
- **Scope:** Management, specifically a subset of management entitled asset management.
- **Term to name the Attributes:** Dimensions / Category.
- **Attributes (4):** Strategy; Tools; Environment; Resources.
- **Levels:** 1 (Initial); 2 (Repeatable); 3 (Defined); 4 (Managed) and 5 (Optimizing).

2.2.2 Records Management Maturity Model

This maturity model was created by JISC infoNet and stands as a self-assessment tool for higher education institution in England and Wales [6]. It is based on a code of practice and its aim is to help in the compliance with this code although it is independent from the code and the future plans are to continue development and enhancement independent from this code.

In detail:

- **Aim:** Help higher education institutions to assess their current approach on records management in regard to

recommendations issued by the United Kingdom government and benchmark against other similar organizations.

- **Scope:** Management, specifically information management.
- **Term used to name of the Attributes:** Section.
- **Attributes (9):** Organizational arrangements to support records management; Records management policy; Keeping records to meet corporate requirements; Records systems; Storage and maintenance of records; Security & access; Disposal of records; Records created in the course of collaborative working or through out-sourcing; Monitoring and reporting on records management.
- **Levels:** Level 0 (Absent); Level 1 (Aware); Level 2 (Defined) and Level 3 (Embedded).

2.2.3 Digital Asset Management (DAM) Maturity Model

The DAM maturity model builds on the ECM3 maturity model [7]. This model was developed having in mind that the successful implementation of DAM in organizations goes beyond the use of technology. It requires a holistic approach which includes people, systems, information and processes. This maturity model provides a description of where an organization is, where does it need to be so that it can perform gap analysis and comprehend what it needs to do to achieve the desired state of DAM implementation.

In detail:

- **Aim:** Improve the success rate of DAM projects in organizations by providing a way of assessing the current state of the current implementation, as well as, an improvement path for enhancement of DAM.
- **Scope:** Management, more specifically Digital Asset Management.
- **Term used to name of the Attributes:** Categories / Dimensions.
- **Attributes (4/15):** People (Technical Expertise; Business Expertise; Alignment); Information (Asset; Metadata; Reuse; Findability; Use Cases); Systems (Prevalence; Security; Usability; Infrastructure); Processes (Workflow; Governance; Integration).
- **Levels:** Level 1 (Ad-Hoc); Level 2 (Incipient); Level 3 (Formative); Level 4 (Operational) and Level 5 (Optimal).

2.2.4 Enterprise Content Management (ECM) Maturity Model

In order to efficiently deploy ECM solutions organizations need to plan and develop a comprehensive strategy. That strategy must encompass the human, information and systems aspects of ECM [8]. If we look from a practical view, organizations cannot deal with all the ECM challenges at the same time. As such organizations need to enhance their ECM implementation step-by-step wise, by following a roadmap for ECM improvement. This maturity model provides the tools to build this roadmap by providing the current state of ECM implementation as well as a roadmap to reach the required maturity level.

In detail:

- **Aim:** Build a roadmap for ECM improvement, in a step-by-step fashion ranging from basic information collection and simple control to refined management and integration.
- **Scope:** Management, more specifically, Enterprise Content Management.
- **Term used to name of the Attributes:** Categories / Dimensions.
- **Attributes (3/13):** Human (Business Expertise; IT; Process; Alignment); Information (Context/Metadata; Depth; Governance; Re-Use; Findability); Systems (Scope; Breadth; Security; Usability)
- **Levels:** Level 1 (Unmanaged); Level 2 (Incipient); Level 3 (Formative); Level 4 (Operational) and Level 5 (Pro-Active).

2.2.5 Information Governance Maturity Model

This maturity model builds on the generally accepted recordkeeping principles developed by ARMA [9]. The principles provide high-level guidelines of good practice for recordkeeping although they do not go into detail to the implementation of these principles and do not have further details on policies, procedures, technologies and roles. The point of this maturity model is to address this gap by detailing what a successful implementation of information governance is at different levels of maturity.

In detail:

- **Aim:** Help organizations understand the standards, best practices and regulatory requirements that enclose information governance, so that they can understand what are the successful information governance characteristics at differing levels of maturity.
- **Scope:** Governance, more specifically a subset of governance entitled Information Governance.
- **Term used to name of the Attributes:** Principles.
- **Attributes (8):** Accountability; Transparency; Integrity; Protection; Compliance; Availability; Retention; Disposition.
- **Levels:** Level 1 (Sub-standard); Level 2 (In Development); Level 3 (Essential); Level 4 (Proactive) and Level 5 (Transformational).

3. DEVELOPMENT STRATEGY

This section focuses on the development strategy used for developing the maturity model for information governance. In order to develop the maturity model for information governance we will use several references from various relevant domains, such as, information management, records management, archival management, asset management and digital preservation.

Some of these references include:

1. **ISO 14721:** Space data and information transfer systems – Open archival information system – Reference model;
2. **ISO 16363:** Space data and information transfer systems – Audit and certification of trustworthy digital repositories;
3. **MoREQ 2010:** Model Requirements for the Management of Electronic Records;
4. **ISO 11442:** Technical product documentation – Document management;
5. **ISO 13008:** Information and documentation – Digital records conversion and migration process;
6. **ISO 15489:** Information and documentation – Records management;
7. **ISO 16175:** Information and documentation – Principles and functional requirements for records in electronic office environments;
8. **ISO 17068:** Information and documentation – Trusted third party repository for digital records;
9. **ISO 18128:** Information and documentation – Risk assessment for records processes and systems;
10. **ISO 23081:** Information and documentation – Managing metadata for records;
11. **ISO 30300:** Information and documentation – Management systems for records – Fundamentals and vocabulary;
12. **ISO 30301:** Information and documentation – Management systems for records – Requirements;
13. **ISO 38500:** Corporate governance of information technology;
14. **ISO 27001:** Information security management.

For the purpose of the preliminary exercise in this paper we will use the Trustworthy Repositories Audit & Certification (TRAC) as the main reference. Its purpose is to be an audit and certification process for the assessment of the trustworthiness of digital repositories, and its scope of application it's the entire range of digital repositories. It is based on the OAIS model [12]. The final version of TRAC was published in 2011, it contains 108 criteria that are divided into three main sections: Organizational Infrastructure; Digital Object Management; and Infrastructure and Security Risk Management. A successor version of TRAC, a standard for Trusted Digital Repositories (TDR), was published in February 2012 as the ISO 16363:2012 standard [10].

The maturity model for information governance, depicted in Sections 3.1 to 3.3, consists of three dimensions:

- **Management:** "The term management refers to all the activities that are used to coordinate, direct, and control an organization. In this context, the term management does not refer to people. It refers to activities. ISO 9000 uses the term top management to refer to people." [11]
- **Processes:** "A process is a set of activities that are interrelated or that interact with one another. Processes use resources to transform inputs into outputs. Processes are interconnected because the output from one process becomes the input for another process. In effect, processes are "glued" together by means of such input output relationships." [11]
- **Infrastructure:** "The term infrastructure refers to the entire system of facilities, equipment, and services that an organization needs in order to function. According to ISO 9001, Part 6.3, the term infrastructure includes buildings and workspaces (including related utilities), process equipment (both hardware and software), support services

(such as transportation and communications), and information systems." [11]

These dimensions provide different viewpoints of information governance which help to decompose the maturity model and enable easy understanding.

For each dimension we have a set of levels, from one to five, where one show the initial phase of maturity of a dimension and level five shows that the dimension is fully mature, self aware and optimizing. These levels and their meaning were adapted from the levels defined for SEI CMMI. [3]

To use this maturity model an organization needs to position itself in the maturity matrix in each of the dimensions. This step is called self-assessment. The self-assessment consists of following a series of predetermined steps in which the organization answers a series of questionnaires that will result in a maturity level. This self-assessment method will also be developed in conjunction with maturity model so that they are fully aligned.

With the resulting maturity levels for each of the dimensions that resulted from the self-assessment, the organization can identify the desired maturity level for each of the dimensions and realize the work that needs to be done in order to reach that level. This results in better understanding of the steps needed to reach the organization goal and also helps to better allocate budget for improving maturity of information governance and an even help to substantiate expenditure to top management.

3.1 Management

3.1.1 Level 1 (Initial)
Management is unpredictable; the business is weakly controlled and reactive. The required skills for staff are neither defined nor identified. There is no planned training of the staff.

3.1.2 Level 2 (Managed)
There is awareness of the need for effective management within the archive. However, there are no policies defined. The required skills are identified only for critical business areas. There is no training plan, however training is provided when the necessity arises.

3.1.3 Level 3 (Defined)
The documentation, policies and procedures that allows for effective management are defined.

There is documentation of skill requirements for all job positions within the organization. There is a formal training plan defined; however it is not enforced.

3.1.4 Level 4 (Quantitatively Managed)
The organization monitors its organizational environment to determine when to execute its policies and procedures.

Skill requirements are routinely assessed to guarantee that the required skills are present in the organization. There are procedures in place to guarantee that a skill is not lost when staff leaves the archive. There is a policy for knowledge sharing of information within the organization that is described in the training plan. The training plan is also assessed routinely.

3.1.5 Level 5 (Optimizing)
Standards and best practices are applied. There is an effort for the organization to undergo assessment for certification of standards. The organization is seen as an example of effective management among its communities and there is continuous improvement of all management procedures. There is encouragement of continuous improvement of skills, based both on personal and organizational

goals. Knowledge sharing is formally recognized in the organization. The organization staff contributes to external best practice.

3.2 Processes

3.2.1 Level 1 (Initial)
Ingest, Archival and Dissemination of content are not done in a coherent way. Procedures are ad-hoc and undefined, the archive may not even be prepared to ingest, archive and disseminate content.

3.2.2 Level 2 (Managed)
There is evidence of procedures being applied in an inconsistent manner and based on individual initiative. Due to fact that the processes are not defined, most of the times the applied procedures cannot be repeated.

3.2.3 Level 3 (Defined)
The Ingest, archival and dissemination processes are defined and in place. For ingest, is defined which content the archive accepts and how to communicate with producers, the creation of the Archival Information Package is defined as well as the Preservation Description Information necessary for ingesting the object into the archive. For archival, preservation planning procedures are defined and the preservation strategies are documented. For dissemination, the requirements that allow the designated community to discover and identify relevant materials are in place, and access policies are defined.

3.2.4 Level 4 (Quantitatively Managed)
The Ingest, Archival and Dissemination processes are actively managed for their performance and adequacy. There are mechanisms to measure the satisfaction of the designated community. There are procedures in place that measure the efficiency of the ingest, archival and dissemination processes and identify bottlenecks in these processes.

3.2.5 Level 5 (Optimizing)
There is an information system that allows for process performance monitoring in a proactive way so that the performance data can be systematically used to improve and optimize the processes.

3.3 Infrastructure

3.3.1 Level 1 (Initial)
The infrastructure is not managed effectively. Changes in the infrastructure are performed in a reactive basis, when there is hardware/software malfunction or it becomes obsolete. There are no security procedures in place. The organization reacts to threats when they occur.

3.3.2 Level 2 (Managed)
There is evidence of procedures being applied to manage the infrastructure. There is awareness of the need to properly define the procedures that allow for effective management of the infrastructure that supports the critical areas of the business. There are security procedures in place. However, individuals perform these procedures in different ways and there is no common procedures defined.

3.3.3 Level 3 (Defined)
Infrastructure procedures are defined and in place. There are technology watches/monitoring, there are procedures to evaluate when changes to software and hardware are needed, there is software and hardware available for performing backups and there are mechanisms to detect bit corruption and reporting it. Security procedures are defined and being applied in the organization. The

security risk facts are analyzed, the controls for these risks are identified and there is disaster preparedness and recovery plans.

3.3.4 Level 4 (Quantitatively Managed)

There are procedures in place that actively monitor the environment to detect when hardware and software technology changes are needed. The hardware and software that support the services are monitored so that the organization can provide appropriate services to the designated community. There are procedures in place to record and report data corruption that identify the steps needed to replace or repair corrupt data. The security risk factors are analyzed periodically and new controls are derived from these risk factors. There are procedures to measure the efficiency of these controls to treat the security risk factors identified. Disaster preparedness and recovery plans are tested and measured for their efficacy.

3.3.5 Level 5 (Optimizing)

There is an information system that monitors the technological environment and detects when changes to hardware and software are needed and reacts to it by proposing plans to replace hardware and software. There is also a system that detects data corruption and identifies the necessary steps to repair the data and acts without human intervention. To allow for continuous improvement there are also mechanisms to act upon when the hardware and software available no longer meets the designated community requirements. There is an information system that manages security and policy procedures and the disaster and recovery plans which allows for continual improvement. There is a security officer that is a recognized expert in data security.

4. CONCLUSIONS

This paper presented the fundaments of a maturity model for information Governance, as well as, a state of the art on maturity models surrounding information governance found in literature. Based on that state of the art and other references from the archival domain, namely the ISO16363 we developed a maturity matrix consisting of three dimensions and five levels.

Further on the goal is to analyze other references from different domain, such as, records management as detailed before which will enhance, detail and help develop the maturity model that will be developed in the scope of the E-ARK project. Moreover, there will also be a method to perform a self-assessment of this maturity model which will result in a toolset consisting of both the maturity model and the self-assessment method which will help assessing the state of information governance in organizations as well as provide an improvement path that organizations can follow to enhance their information governance practice.

5. ACKNOWLEDGEMENTS

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