

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 that allow for a systematic approach to maturity model development backed up by a well-known and proved scientific research method called Design Science Research.

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 [1]. 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: Sect. 2 presents the related work that can influence the development of the maturity model, Sect. 3 presents the development strategy for the maturity model as well as a first example of the maturity model based on the ISO16363 and ISO20652 and based on the levels from SEI CMMI [2]. Section 4 presents the assessment strategy for the maturity model. Section 5 presents the conclusions of this paper. The maturity model presented here is being developed in the context of the E-ARK project.

2 Related Work

This section details the related work relevant for this paper, namely the maturity model fundamentals and maturity assessment methods. These are essential to understand the remaining of this paper.

2.1 Maturity Model Fundamentals

To evaluate maturity, organizational assessment models are used, which are also known as stages-of-growth models, stage models, or stage theories [12].

The concept of maturity is a state in which, when optimized to a particular organizational context, is not advisable to proceed with any further action. It is not an end, because it is a mobile and dynamic goal [3]. It is rather a state in which, given certain conditions, it is agreed not to continue any further action. Several authors have defined maturity, however many of the current definitions fit into the context in which each a particular maturity model was developed.

In [4] maturity is defined as a specific process to explicitly define, manage, measure and control the evolutionary growth of an entity. In turn, in [5] maturity is defined as a state in which an organization is perfectly able to achieve the goals it sets itself. In [6] it is suggested that maturity is associated with an evaluation criterion or the state of being complete, perfect and ready and in [7] as being a concept which progresses from an initial state to a final state (which is more advanced), that is, higher levels of maturity. Similarly, in [8] maturity is related with the evolutionary progress in demonstrating a particular capacity or the pursuit of a certain goal, from an initial state to a final desirable state. Still, in [9] it is emphasized the fact that this state of perfection can be achieved in various ways. The distinction between organizations with more or less mature systems relates not only to the results of the indicators used, but also with the fact that mature organizations measure different indicators when comparing to organizations which are less mature [10]. While the concept of maturity relates to one or more items identified as relevant [11], the concept of capability is concerned only with each of these items. In [12] maturity models are defined as a series of sequential levels, which together form an anticipated or desired logical path from an initial state to a final state of maturity. These models have their origin in the area of quality [13, 14]. The Organizational Project

Management Maturity Model (OPM3) defines a maturity model as a structured set of elements that describe the characteristics of a process or product [15, 16]. In [17] maturity models are defined as tools used to evaluate the maturity capabilities of certain elements and select the appropriate actions to bring the elements to a higher level of maturity. Conceptually, these represent stages of growth of a capability at qualitative or quantitative level of the element in growth, in order to evaluate their progress relative to the defined maturity levels.

Some definitions found involve organizational concepts commonly used, such as the definition of [18] in which the authors consider a maturity model as a “... a framework of evaluation that allows an organization to compare their projects and against the best practices or the practices of their competitors, while defining a structured path for improvement.” This definition is deeply embedded in the concept of benchmarking. In other definitions, such as in the presented by [19] there appears the concern of associating a maturity model to the concept of continuous improvement.

In [20], the maturity models are particularly important for identifying strengths and weaknesses of the organizational context to which they are applied, and the collection of information through methodologies associated with benchmarking. In [21] it was concluded that the great advantage of maturity models is that they show that maturity must evolve through different dimensions and, once reached a maturity level, sometime is needed for it to be actually sustained. In [22] it was concluded that project performance in organizations with higher maturity levels was significantly increased. Currently, the lack of a generic and global standards for maturity models has been identified as the cause of poor dissemination of this concept.

2.2 Maturity Assessment

An assessment is a systematic method for obtaining feedback on the performance of an organization and identify issues that affect performance. Assessments are of extreme importance as organizations are constantly trying to adapt, survive, perform and influence despite not being always successful. To better understand what they can or should change to improve the way they conduct their business, organizations can perform organizational assessments. This technique can help organizations obtain data on their performance, identify important factors that help or inhibit the achievement of the desired outcomes of a process, and benchmark them in respect to other organizations. In the last decade, the demand for organizational assessment are gaining ground with the implementation of legislation that mandate good governance in organizations, such as, the Sarbanes-Oxley Act [23] and the BASEL accords in financial organizations [24]. Moreover, funding agencies are using the results of these assessments to understand the performance of organizations which they fund (e.g., Not for profit organizations, European Commission, Banks, Research institutes) as a means to determine how well organizations are developing the desired outcomes, and also to better understand the capabilities these organizations have in place to support the achievement of the desired outcome.

The result of an assessment effort will be a set of guidelines which will allow for process improvement. Process improvement is a way of improving the approach taken for organizing and managing business processes and can involve also executing improvements to existing systems. There are several examples of process improvement such as compliance with existing legislation. Process improvement often results in process redesign which involves understanding the requirements of a stakeholder and developing processes which meet the stakeholders' expectations. This often means that the existing processes supporting a specific part of business need to be adapted, or even made from scratch to meet the stakeholders' expectations. When the processes need to be made from scratch we are dealing with process reengineering which is a way to introduce radical changes in the business processes of an organization and changes the way a business operates. In this way, process reengineering starts from scratch by determining how the key business activities need to be reengineered to meet stakeholders' expectations. One well known example, is the transition from traditional banking services to on-line banking services.

The ISO/IEC 15504, describes a method that can be used to guide the assessment of organizational processes, which is depicted in Fig. 1. The ISO15504 assessment method is composed of seven main steps which are then further detailed in atomic tasks.

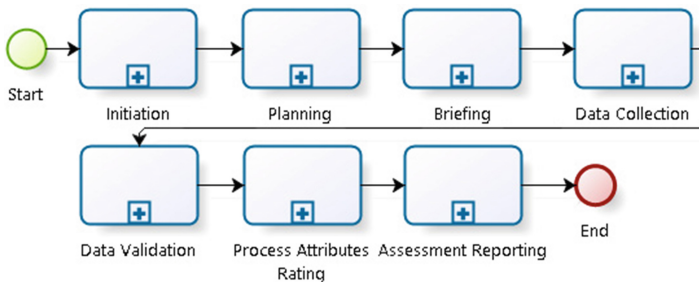


Fig. 1. ISO15504 assessment process overview

2.3 Maturity Models in Related Areas

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. The synthesis of the analyzed maturity models is presented in Table 1.

Table 1. Synthesis of the analyzed maturity models

Maturity model	Attributes		Maturity levels
	Name	Number	
Asset management maturity model [25]	Dimensions/category	4	1 (Initial); 2 (repeatable); 3 (defined); 4 (managed) and 5 (optimizing)
Digital asset management (DAM) maturity model [26]	Categories/dimensions	4/15	Level 1 (Ad-Hoc); Level 2 (incipient); level 3 (formative); level 4 (operational) and level 5 (optimal)
Information governance maturity model [27]	Principles	8	Level 1 (sub-standard); level 2 (in development); level 3 (essential); level 4 (proactive) and level 5 (transformational)

3 Development of a Maturity Model for Information Governance

One recurrent criticism of maturity models is that they lack empirical foundation and traceability [28]. The main reason for the criticism is that existing maturity models typically do not follow a theoretical framework or methodology for their development [28]. In fact, there is an absence on literature regarding methods and practices for the design and development of maturity models [28].

One of the most known development model for maturity models is the one from Becker in [29], a procedure based on a scientific research method called Design Science Research (DSR). The well-argued claim of the design procedure [29] is that these fundamental requirements should drive the development of every maturity model. Apart from evaluating well-known models according to these dimensions, the article also delineates 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. The procedure delineates eight requirements [29], (1) 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) Iterative Procedures are followed to ensure a feedback loop and refinement; (3) The principles, quality and effectiveness behind the design and development effort of a maturity model should pass through an iterative Evaluation step; (4) The design and development of maturity models should follow a Multi-methodological Procedure which use must be well founded; (5) 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) Problem Definition should include the application domain for the maturity model and also detail the intended benefits and constraints of application; (7) There should be a Targeted Presentation of Results regarding the users' needs and application constraints and, (8) 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.

One limitation of existing maturity models is that it is not typically not clear which requirements were used for the design and development of the model. In other words, there is a weak or inexistent traceability between the maturity model and the requirements that are used as reference. Consequently, stakeholders that wish to use the maturity model are unable to understand if the model is aligned with current best practices. To address the aforementioned traceability problem the maturity model described in this paper is based in well-known references of IG. Due to the fact that IG is a multi-disciplinary fields that covers several disciplines the range of standards and references documents is vast and include references, such as, the ISO 16363, ISO 20652, ISO 14721, MoREQ 2010, ISO 16175, ISO 23081, ISO 30301, ISO 27001, among others.

The maturity model for information governance, depicted further on in this section, consists of three dimensions:

- **Management:** “The term management refers to all the activities that are used to coordinate, direct, and control an organization.” [30]
- **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.” [30]
- **Infrastructure:** “The term infrastructure refers to the entire system of facilities, equipment, and services that an organization needs in order to function.” [30]

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 [2].

Management

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.

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.

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.

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.

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.

Processes

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.

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.

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.

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.

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.

Infrastructure

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.

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.

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

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 risks 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 risks identified. Disaster preparedness and recovery plans are tested and measured for their efficacy.

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 Assessment of a Reality Using the Maturity Model for Information Governance

This section details the assessment strategy used in the development of the maturity model proposed in this paper. According to [8] there are three possible types of maturity assessment methods, (1) self-assessment where there are guidelines and forms for an organization to perform self-assessment (2) third-party assisted where a third-party help the organization in applying the assessment method and, (3) certified professionals where organizations can apply for certification, in which case a group of competent assessors will perform the assessment.

For the purpose of this maturity model we opted for the self-assessment method as it provides a way for organizations to assess their IG practice while maintaining a low cost to the organizations. Moreover, we defined three main scopes for the assessment depending on the nature of the organization being assessed. The first is the Information Governance Maturity Assessment (IGMA) for Producers (IGMA P) which is used to assess organization that create content. The second is the IGMA for Archives (IGMA A)

which is used to assess organizations that archive content, such as, archives. Finally, the IGMA for producers and archives (IGMA PA) which is used to assess organization that are both producers of content and also archive content. An example of such organization would be a national archive that digitizes content and then archives it using an in-house infrastructure. For each of these scopes the assessment questionnaire will be different and only appropriate to the organizations that meet a certain scope. Despite this fact, the self-assessment questionnaire, for each of the three scopes is comprised of a set of questions.

The questionnaire starts by providing an introduction. This introduction provides details on the purpose of the questionnaire, how it will be analysed, and clarifies concepts being constantly used throughout the questionnaire. This questionnaire consists of a set of questions that will be used to determine the maturity levels of an organization for each of the three dimensions of the IG Maturity Model.

The answers provided will then be analysed by the Information Governance Maturity Model development team and a report will be issued detailing all the findings of the assessment. For each question there is a field respondents can use to provide additional comments, clarifications or a justification to the answer. These comments will be considered by the assessment team when evaluating the answers.

For the first assessment, as a proof of concept, we asked seven organizations that are comprised in the IGMA P to fill the self-assessment questionnaire for the processes dimension of the maturity model which was comprised of 35 questions. The results from this first assessment are presented in Fig. 2.

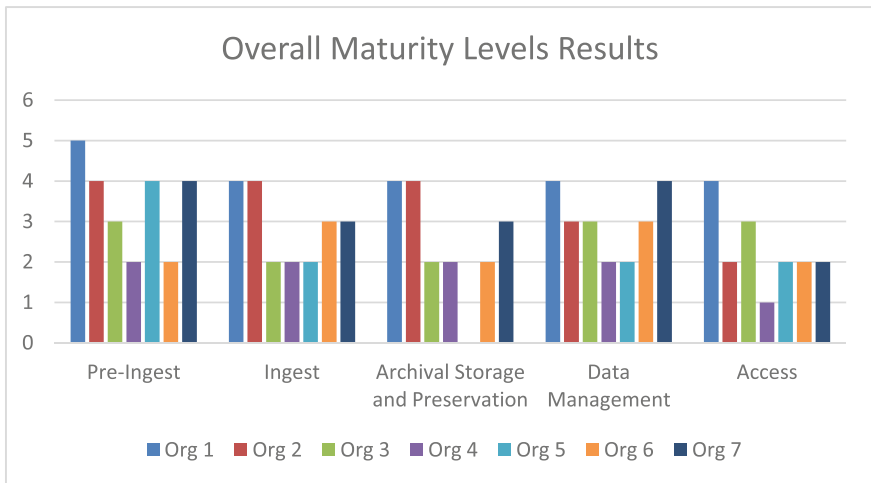


Fig. 2. Results of the first assessment using the maturity model for information governance

Organization 1 is the one which achieved the best overall results, especially in pre-ingest and access it achieved the best results. Organization 2 achieved the second best results. However there are still some enhancements to perform in the access capability where it achieved maturity level 2. Despite this fact, the access capability is

not the focus in Organization 2. Organization 7 also shows a high level maturity across the capabilities measured in the assessment. However, as in Organization 2, there are still some important enhancements to perform to the access capability. In organization 7, the importance of the access capability is considerable due to it being one of the focuses of the organization.

The other four organizations showed similar results among the capabilities. With some exceptions for organization 3, where it shows higher maturity levels for pre-ingest and the access capabilities. Another exception is organization 6 which shows higher maturity levels for ingest and data management capabilities. Organization 5 did not answer to the questions for the archival storage and preservation and as the result no maturity level was calculated. As this is not the focus capability of the organization there is no major problem with this fact.

There are still several capabilities at maturity level 1 or 2 for all organizations except organization 1. These should be addressed as soon as possible to reach at least maturity level. This is due to the fact that maturity level 3 is considered an intermediate level between lack of definition of consistency of mechanism and procedures typical of maturity level 1 and 2; and the documentation and assessment of mechanism and procedures typical of maturity level 4 and 5. Maturity level 3 depicts aspects that are consistent and defined throughout the organizational context and shows a state of change in this context from no definition to improvement. The results of the E-ARK project will help the organizations to reach this maturity level and will also assist other organizations to reach higher levels of maturity and as result improve archival practice.

5 Conclusions and Future Work

This paper presented the fundamentals 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 and ISO20652 we developed a maturity matrix consisting of three dimensions and five levels.

Moreover, it was also presented a method to perform a self-assessment of this maturity model which consists of a toolset consisting of both the maturity model and the self-assessment method which guides the assessment of the state of information governance in organizations as well as provide an improvement path that organizations can follow to enhance their information governance practice.

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.

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