Evaluating a Process for Developing a Capability Maturity Model

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ABSTRACT
Maturity Models have been proven to be powerful tools to assess to current state of an organization regarding a certain aspect and drive improvement. However, maturity models are often developed ad hoc, without following a well-documented design and development method, and often do not provide a pathway to further extend and update the model to foster systematic enhancements and extensions. This paper discusses a systematic approach to maturity model development and applies it to the concrete domain of long-term information management. We trace the steps from problem definition to maturity model evaluation and apply the maturity model to a specific organizational scenario.

Categories and Subject Descriptors
H.1 [**Information Systems**]: Models and Principles; J.1 Administrative Data Processing Government; K.6.4 Management of computing and Information Systems

General Terms
Management, Measurement, Documentation, Design and Verification.

Keywords
Capability, Requirements Engineering, Process Engineering, Maturity Models, Method.

1. INTRODUCTION
In the last decades, organizations have found that they need to continuously adapt in order to remain competitive in the globalized world. Organizations must revise their processes taking into account new best practices by following them and ensuring they are aware of threats to their continuous operation in order to mitigate them. In the Information Technology (IT) domain, substantial efforts have helped to create a common body of knowledge which helps governing IT. These efforts have resulted in best practices, standards and sometimes full-fledged frameworks which aim at aligning the IT domain with the overall business strategy. There are numerous frameworks currently being applied in organizations to govern IT as, for example, IT-CMF [1], COBIT [2] and ISO 38500 [3].

These frameworks generally describe a set of processes which, when followed, will allow the fulfillment of a certain aspect of IT. Some of them, such as IT-CMF, contain a capability maturity model which will help organizations know what the current maturity of a certain process is and how to enhance this process maturity. Others, such as COBIT 5, suggest other standards (ISO 15504 [4]) in order for an organization to measure its processes maturity level.

However, these frameworks do not take into account every possible aspect of IT. This, however, is of utmost importance as IT is an ever changing domain and new aspects which require governing activities appear every year. Hence, these frameworks should provide a common method to extend, enhance and develop the framework. Such a method should include guidelines on how to create new processes, how to create maturity models for these processes, and how to align new processes with existing ones.

In order to address this gap, this paper applies and evaluates a systematic approach to maturity model development and evaluation. The approach is framework and domain agnostic and backed by a powerful research methodology, Design Science Research (DSR) [5]. At its heart, it outlines eight requirements for maturity model development: (R1) A Comparison with existing maturity models must be performed, (R2) Iterative Procedures are followed, (R3) The design and development of the model is evaluated iteratively, (R4) A multi-methodological procedure is followed, (R5) The problem relevance is clearly identified, (R6) A detailed problem definition is provided, (R7) Targeted presentation of results is ensured, (R8) Scientific documentation is provided.

We followed this method in order to create a maturity model for long-term information management, which is often described as digital preservation (DP). As the name implies, the area aims at providing information management guidelines which will manage information through its lifecycle while also taking into consideration the long-term perspective of information management. This is a trending topic nowadays: As the IT domain evolves, so do key aspects such as file formats, hardware, and software. This inevitably causes obsolescence. While this can be of no concern to organizations where information has a short life, to other organizations it is threatening to business continuity or regulations-compliant operations. In this sense, DP can be seen as a set of actions and techniques which are the response to the threat of obsolescence, business continuity and long-term compliance. It can also be seen as way of guaranteeing systems heritage to future generations.

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2. PROBLEM DEFINITION

The importance of a long-term perspective on the sustained management of information within IS is increasingly recognized. The field of DP is focused on developing frameworks, systems and processes to make authentic digital information understandable over time. As such, it is becoming an important enabler of information processing chains where a longer-term perspective across technological disruptions is required.

Established IT Governance frameworks do not explicitly recognize or address concerns of longevity in IT environments. Yet, organizations with a long-term vision on the value of digital information need to manage expectations on information longevity, set specific goals on the corresponding processes, assign appropriate responsibilities, measure the performance of preservation and access mechanisms, and exercise informed control over such processes. DP is traditionally understood as the management of digital information over time. It is the set of processes and activities that ensure continued access to assets existing in digital formats.

DP per se is not necessarily an organizational objective. It can be seen from different perspectives, as a new business opportunity or an identified threat to an organization. In most cases it is seen as a threat, as for example a state archive or national library may have millions of objects to care for. Clearly, that requires the provision of accurate curation and preservation activities in order to ensure the value of the objects. These objects can either be physical or digital, which should be available for generations to come.

By using DP techniques, such an organization can mitigate the risks identified by, for example, having a watch service to constantly monitor the obsolescence of formats or transform the physical objects into digital objects. A variety of associated techniques such as transformation and migration can all be used to mitigate certain risks related to business continuity, format obsolescence, physical objects preservation and others. However, it is only within a well-defined framework that deployment of any of these techniques will successfully yield value to the organization in the form of continually useful and accessible information. The capability maturity model we are developing is meant to guide the design and deployment of such organizational capabilities.

3. CONCLUSION

The eight requirements (R1 – R8) necessary to develop a maturity model presented in [5] were followed and addressed throughout the whole development stage. We conducted a comparison with existing maturity models in fulfilling R1. We followed an iterative procedure for development by applying the different iterations of the maturity model to the use case which fulfills R2. After each development iteration, we evaluated our maturity model by meeting with stakeholders of a representative organization, revisiting the criteria and levels and adapting the criteria where they were considered ambiguous, or unrealistic, thus fulfilling R3. We investigated the use of different models for our maturity model: Apart from the continuous IT-CMF inspired model, we are developing a staged model based on the COBIT 4.1 maturity model which depicts a set of dimensions for each process, hence fulfilling R4.

Long-term information management (or DP) does not have a well-developed, documentation-intensive maturity model. Yet, it is becoming a very important aspect of IT, dealing with important issues such as data/format obsolescence and business continuity. This relevance study fulfills R5. In this paper, we defined which problem exists (the lack of guidance on long-term information management by leading IT frameworks) and presented our maturity model, which will bring benefits to organizations as they can assess how well their processes support the achievement of the organizational goals and provides a clear path for process improvement, fulfilling R6.

The interviews with the staff of the presented use case helped to scope the maturity model by assessing the conditions of the maturity model application within the organization and the needs of the users of this specific domain, fulfilling R7. Throughout the whole design process, we documented in detail each step of the process, detailing who was involved, the methods chosen and the results. This helped to maintain a coherent development of the maturity model backed up by a powerful documentation of all of the choices made. This documentation also helped in the writing of this paper, although the whole content could not be made available due to space constraints, fulfilling R8.

In conclusion, the procedure used to develop our maturity model has proven very helpful, as it allowed the development of a methodically well-founded maturity model design and an evaluation of the designed model. Further application to different problems and domains will further provide evidence that this procedure is in fact efficient and effective in the design and evaluation of maturity models. Finally, the contingency factors which affect the development and deployment of the maturity model need to be explored.

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