

Design and Implementation Challenges of Maturity Models for Healthcare Organizations: An Experience Report

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In the recent years a wide range of generic and domain-specific maturity models (MM) have been developed in order to improve organizational design and learning of healthcare organizations. While many of these studies describe methods on how to measure dedicated aspects of a healthcare organization's "maturity", little evidence exists on how to effectively implement and deploy them into practice. This paper therefore delineates the encountered challenges during the design and implementation of three maturity models for distinct improvement areas in hospitals. The findings of this study, on the one hand, may serve as basis for refining existing MM design approaches; on the other hand, it may facilitate further research in domain-specific organizational design with MM.

Keywords

Action design research, change engineering, healthcare organizations, maturity model, organizational design.

1. Introduction

Maturity models (MM) are recognized tools for the stepwise and systematic development and/or improvement of skills, processes, structures or general conditions of an organization. It has its roots in software engineering where it was found relatively helpful in guiding and monitoring the maturity of software development practices. The Capability Maturity Model (CMM), BOOTSTRAP or the international standard ISO/IEC 15504 commonly referred to as SPICE (Software Process Improvement and Capability determination) are but a few examples for largely successful MM [1, 2]. Besides generic areas of application, there are also more and more MM designed for examining domain-specific processes or technologies. A brief review of the literature showed that a variety of healthcare specific models, covering a wide range of improvement areas such as software quality [3], software security [4], risk management [5], health supply management [6] or hospital collaboration [7] exist.

Common to practically all these MM is the notion of having a staged representation of an actual state in relation to a potentially achievable goal state and a description of steps required to achieve this objective. The major aim is to identify gaps between actual and desired states as well as to demonstrate an evolutionary path to achieve the improvement from a desired to an actual state. In specifying this imaginary improvement trial, most MM apply a top-down approach by fixing a number of maturity stages or levels first and further corroborating it with characteristics (typically in form of specific assessment items) that support the initial assumptions about the maturity distribution. This has led to a strong criticism, since many MM seemed to be quite arbitrary. This problem has been dealt with in the recent literature by proposing sophisticated data-driven (bottom-up) techniques and algorithms [8-10].

However, while current research is occupied with the specification of ever more rigorous approaches for developing MM, there has been a general disregard of effectively implementing MM in complex organizational environments [11, 12]. The aim of this article is therefore to identify and designate major challenges and risks when it comes to the implementation of MM in the daily practice of healthcare organizations. We thus strive to answer the following research question: *What are major*

challenges and mistakes when implementing maturity models as means for the improvement of healthcare practice?

Since MM implementation and development are mutually influenced by each other, we will not only reflect on how to effectively integrate MM in healthcare organizations, but also bring forward some considerations to positively adept design of MM in order to foster a broader proliferation. The remainder of the paper is organized as follows: In the next section the research methodology of this study is discussed. This is followed by a report on findings drawn from three projects aimed at developing healthcare-specific MM. Finally, we present our conclusions and recommendations for future research.

2. Research Method

Epistemologically, we position our work as interpretative research in that we perceive knowledge of reality as a social construct by human actors [13]. Consequently, “value-free data cannot be obtained, since the enquirer uses his or her preconceptions in order to guide the process of enquiry, and furthermore the researcher interacts with the human subjects of the enquiry, changing the perceptions of both parties” [14]. Hence, we acknowledge our own subjectivity as part of research. The next section reports on experiences drawn from three different projects, which were conducted from 2008-2012 on distinct areas of health informatics and health information management. The first project aimed at developing a MM for measuring the IT-capability of hospitals; the second MM dealt with the improvement of the supplier relationship management systems of hospitals; the third project emphasized the development of a MM for improving intra- and inter-organizational collaboration of hospitals. The final result of all the three research projects is a software prototype. The first two instantiations are in commercial use.

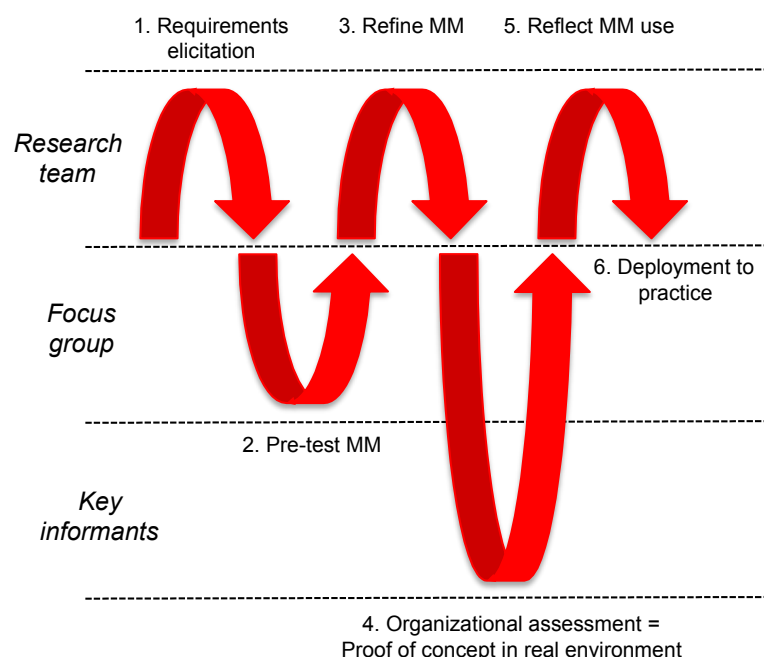


Figure 1 Adapted Action Design Research Approach [15].

All three projects were guided through the University of St. Gallen. At least one of the authors participated as senior researcher working together with representatives from several hospitals in order to develop the basis for the maturity models. This was done in a two-step approach starting with focus group workshops with management representatives from the participating hospitals. In a second step the findings were repeatedly evaluated and refined with practitioners from the administrative team, the nursing care and the medical profession of the different hospitals. This on the one hand led to more focused insights and on the other fostered acceptance of the model use among hospital personal.

Common to all three projects is the adoption of action design research (ADR) as underlying research method. ADR is used for “generating prescriptive design knowledge through building and evaluating ensemble IT artifacts in an organizational setting” [15]. In doing so, a research team faces two kinds of assignments: (1) addressing a problem situation encountered in a specific organizational setting by intervening and evaluating; and (2) constructing and evaluating an IT artifact that addresses the class of problems typified by the encountered situation. According to [15], research using ADR follows a generic schema or interaction pattern. Our research process and interaction with practitioners is illustrated in Figure 1. After a first phase of requirements elicitation (mainly desk research), we then used focus group discussions to pre-test a first version of our new MM. This commonly served as first basis for refining the MM and getting more specific feedback for the software design. The initial (physical) prototype allowed us to conduct organizational assessments in several hospitals. This in turn helped us to identify the key challenges and mistakes on which we will report in the next section.

3. Results

As depicted in Figure 2 and described above, design and implementation of MM are interconnected. It is therefore often difficult to draw a straight line if a challenge rather is allocated to the design or implementation phase. In order to structure our experiences, we will relate to the two MM cycles described in [8].

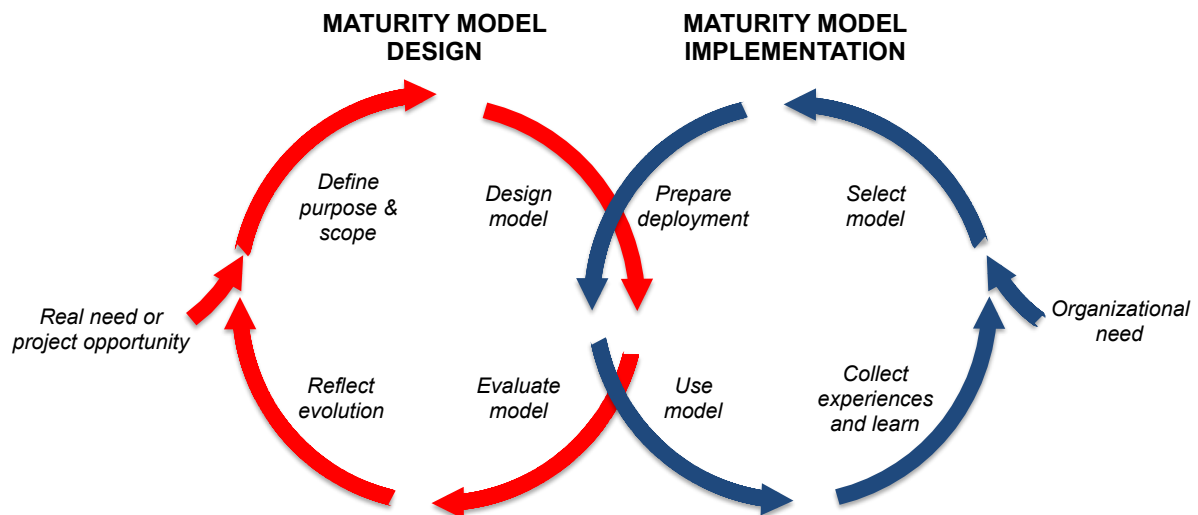


Figure 2 Duality of maturity model design and implementation [8].

3.1 Design Challenges

The implementation success of MM is directly interlinked with the way how the model has been developed and tested [16]. Therefore we first take a closer look on the necessary steps and challenges that might occur during development of a model.

Real need or opportunity driven approach

Each measurement process starts with the questions "what" and "why" something should be measured. Therefore one of the first challenges is how to decide when it is fruitful to use a measurement tool such as a MM. Researchers such as [11] therefore propose to start the process by answering questions regarding the “novelty” of phenomenon and the “innovation” that could be created by a new measurement model. Organizations therefore should clarify if the phenomenon under investigation is a new (emerging) one or if it is an already known (mature) problem. In the latter case, it is very probable that model based solutions already exist. This in turn enables thinking about the “innovation” of the model to decide whether a new model has to be developed or if it is suitable to modify or directly apply an existing model to the phenomenon under investigation.

Especially in view of the increasing economic pressure in the hospital sector, it makes sense to carefully estimate the need of a measurement model in order to avoid wasting resources for a budget consuming new developments. Given the very inter professional organization and with regard to the dual management structure of many hospitals, it is therefore crucial for a sustainable development and successful use of MM to integrate the relevant stakeholders already from the very beginning of the decision making process in order to avoid a later rejection or a boycott of the model as such.

Setting the scene I

Once the question of the need has been answered, the "focus" and the "purpose" of the model have to be defined. As already mentioned it is fundamental for success to clarify which stakeholder(s) should be addressed by the model. Therefore it is necessary to think about the targeted audience and its particularities before designing a model [17]. In the context of hospitals this could be management personal, physicians, nursing staff, or members of the support staff such as IT personal to name just a few. However, it could also be possible that the viewpoint is higher and that the model should be developed for practitioners of different professional groups. As all these different groups do have their own individual language it is a major challenge to find the right language, so to say the "Esperanto" of MM.

This experience was also made by the authors of this article. They encountered the challenge that sometime questions were not understood correctly without further explanation, or that it was hard to find a shared language when crossing professional borders. For actionable results in regard to the assessment of maturity or the definition of maturity itself, a shared understanding, however, is fundamental and the used language for questioners or interviews therefore has to be as understandable as possible. The latter of course will never be possible without greatly reducing language complexity while paying the price of losing specificity at the same time. Therefore, the higher the heterogeneity of the audience, the more difficult and time consuming it is to find a common language in a number of evaluation cycles with practitioners.

Besides the challenge of "language", developers of MM also have to define the observation "depth" and "breadth" of their model. To improve understandability and conserve resources it is therefore helpful to decide whether the model is designed to represent phenomena on either people-, group-, departmental-, organizational-, or even inter-organizational level. Furthermore it should be determined whether the model should be used rather generalist or specific to improve feasibility and reduce understanding difficulties. The decision in regard to these two aspects, of course, depends on the actual purpose of the measurement model on the one hand and influences the "language" of the model on the other hand. Again, it is therefore crucial to have a clear idea of the overall purpose of the model and to incorporate the correct stakeholders in the development process in order to ensure a subsequent acceptance.

Designing the design process

After the need has been elicited and both, audience and scope have been set, the model itself has to be designed. One of the first and at the same biggest challenges in this context therefore is to develop a suitable concept of maturity. Three different concepts, notably the process-focused, the object- or technology-focused, and the people-focused concept of maturity do exist [11]. In the process-focused concept it is measured to which extend a specific process is defined, managed, measured controlled and effective [2]. In other words, it is measured how the efficiency or effectiveness of the current process relates to a possible ideal process (target process) [18]. In the object-focused concept, it is assessed to what extend a product, a machine or anything alike reaches a defined level of satisfaction. Finally in the people-centric concept abilities are at the centre of interest and it is measured to what extend the individual skills are suitable to achieve or support certain organizational goals [19].

The different concepts also show that the aim of improvement is multi-faceted, and may vary, for example, between cost, quality, efficiency or others objectives. In addition to the specification of the objective, or "optimization function", developers also have to decide how one or several objectives are influenced by changings in the maturity path. This is very challenging, as cause-and-effect relationships have to be understood first.

Another question arises with respect to the model base: On what do we found the improvement path? On rather theoretical knowledge, practical-empirical experience, or a combination of both? How do we present our model base? Is it a text document (e.g. a questionnaire), a software product or again rather combination of these?

Providing some proof

Another challenging task is to provide proof whether the MM measures the "right things" in the "right manner". [20] therefore distinguishes between the process of model verification referring to "the

process of determining that a maturity model represents the developer's conceptual description and specifications with sufficient accuracy" and the model validation relating to "the degree to which a MM is an accurate representation of the real world from the perspective of the intended uses of the model". In regard to the evaluation of a MM this means that all principles and premises for the development of a MM, its usefulness, quality and effectiveness, must be evaluated iteratively as long until the model can reproduce the measured phenomenon with few redundancies [21]. According to [22] the evaluation process itself thereby involves frequent iterations between development and evaluation, rather than a procedural approach. It is hence hard to identify a clear start of the evaluation in development process.

Nevertheless the process of evaluation should follow some rules to guarantee rigor. Developers thus should think about the "object" (what should be evaluated), the "time" (when should it be evaluated) and the "way" (how should it be evaluated) to meet the above mentioned criteria and validate the model in a plausible and comprehensible way [23]. In terms of "what" developers have to decide whether only the model itself, its development path, or both should be evaluated. In regard to regular criticism on the validity of MM it was suggested to evaluate the path and the product and thus opening both to scientific evaluation and discussion [11]. Considering the duality and iterative character of the evaluation process, it is clear that this process can take its time. Therefore developers should also define whether the model should be evaluated prospective or retrospective, or continuously throughout the development process. Furthermore it should be clarified who should be asked in order to evaluate the model and who should carry out this evaluation.

Bothering about the future

The MM has to be maintained and further development will be needed given that some model elements will get obsolete, new constructs will emerge, and assumptions on the different levels of maturity will be affirmed or refuted [24]. Therefore, even in an early stage it is important to also reflect on how to handle alterations in model design and deployment.

In order to ensure a certain degree of sustainability, the model should be developed over time. A challenge therefore is to decide whether only the structure of the model as such, its function, or both should be further developed. Also it is important to decide whether the model should be reviewed further developed on the basis of regular intervals and, even more important, who is responsible for deciding that the model does no longer fit certain requirements. In addition, it can help to increase the acceptance of the model as such, by stipulating which stakeholders will be integrated into the process of renewal (management, health professionals, IT specialists etc.).

3.2 Implementation Challenges

Although numerous challenges during the building phase can be identified, several process models and approaches already exist that guide the development process in order to guarantee or at least facilitate rigor. However, in regard to the implementation and use of MM this looks different. The knowledge base on how to use and implement MM in practice is small. We will therefore identify possible challenges and necessary decisions in terms of the implementation of MM and relate them again to the steps of designing such a model.

In need of advice

As in the design phase, the first decision that has to be made during implementation concerns the question, when the use of a maturity model seems reasonable in an organization. MM are primarily characterized by their property to assess an object under observation (instances, processes crossing paths or skills) in terms of their current and a possible target state. A MM thereby includes several maturity levels and describes an anticipated, desired or typical development path. These maturity levels are defined by characteristics and characteristic values [24]. Therefore these models have a dynamic character and thus are well suited for the gradual and evolutionary improvement of situations and conditions.

The decision for or against the use of maturity model should therefore be based on the character of the situation that should be improved. If a gradual improvement in the targeted context seems useful, adequate access to evaluating partners (knowledge base) does exist and sufficient financial resources are available, the implementation and use of a maturity model appears promising. For a useful application of a maturity model, however, it is crucial that the state of maturity can be conceptualized

clearly enough in order to ultimately rate it. The final question is: Do we really need a model that guides our improvement activities?

Pick the right model

After having verified that a MM should be used, another important step for the successful use is to select the right and most appropriate model for the given task. As mentioned earlier hospitals are characterized by a high degree of organizational complexity and specific linguistic features [25]. This means that models either newly developed or reused from other domains need to be strongly tailored to the context of hospitals. Since adapting is usually less time and resources consuming it should be the preferred approach in the context at hand. In addition it is very likely that an already established model has been tested several times and thus meets the criteria of rigor in terms of its development and functionality.

However, in order to decide whether to develop a new model or adapt an existing one, implementers need to have an overview of existing model that might be appropriate for adaptation in order to save resources and avoid deficiencies in rigor [2, 19]. Though, the search for an adaptable model is very time consuming, and only promising if context and the aim of use for the MM are sufficiently known. Since there is no common model base or classification system for MM to date, it is challenging to find the right model for the given task [8]. Therefore a transparent and comprehensible search process underpins the later credibility of the used MM.

In addition to a rigorous search process, the implementation success also heavily depends on the requirement rationales for the maturity model itself. Hence it usually makes little sense to use a MM for unique assessments or doubtful certificates. Rather, in view of the effort and the costs associated with the implementation of MM, hospitals should think of using these models for long-or medium-term change processes (e.g. integrating continuous improvement processes). This, however, requires again a clear picture of the changes that need to be measured and controlled on the bases of MM. In the case of hospitals, MM should therefore be primarily used for changing requirements that were previously assessed by various stakeholders tangent by the object of change as relevant and contemporary.

Setting the scene II

In the organizational deployment phase of MM, managers are often confronted with workforce resistance. This especially applies to healthcare organizations as these organizations are often not used to performance measurement, yet. In order to gain acceptance and improve standardization of the model a two-phase deployment approach is suggested [16].

In a first step the model should be tested with people that are dependent – this could for example be the group of people the model has been developed with. This initial development group has therefore great influence on the appropriateness of the model as such and the awareness the model might reach in the organization during development or adaptation. Important decisions that have to be taken in this phase are which practitioners should serve as information suppliers in order to build a suitable tool. These collaborators should be actively selected according to their knowledge regarding the phenomenon that should be measured and improved. A survey on voluntary basis, instead, can cause key informant bias, because usually these practitioners do cooperate which support the integration of a model and could therefore distort the appropriateness of the model. In political science this phenomenon is well known and describes a systematic measurement error caused by the differences between the subjective perception and the present value of the objective or phenomenon under investigation. As key causes of informant bias, information- and valuation differences apply depending on functional areas, roles and hierarchy levels [26, 27]. This, however, can lead to significant differences in the assessment of facts by different interviewees and therefore directly affects the results of a maturity assessment.

In a next step, the model should be tested with practitioners that are independent of the developing and testing process in order to improving the model [16]. Besides these initiatives to increase generalizability another important decision concerns the question, who should perform the assessment. Depending on the situation self-assessments, third party assisted interviews or interviews by external professionals and/or consultants can be options [11]. During our field research with MM in hospitals we noted several times that self-assessments were often prone to errors due to misunderstandings and that interviews by external consultants were refused. As best practice therefore often the third-party interviews are helpful.

Making use of the results

MM represent tools for evolutionary improvement of objects, skills or conditions. Assessments with these models on regular bases therefore are a critical requirement in order to guide changes over time. Unfortunately, most of the work regarding MM does neither address the question how to

routinize maturity assessments over time nor do they address the challenge how to adapt and develop the model over time (in the assessment process). Therefore maturity assessments are often seen as single, unrelated events. However, as MM guide evolutionary development activities, one of the most important aspects is to address time and change in an appropriate way. Hence, another challenge concerns the question how MM assessment and further developments can be anchored in the organizational and personal routines, processes, and culture. In addition it is necessary to appoint responsibility to one or more representatives of the organization in order to guarantee a periodic and regular use.

In hospitals responsibility for MM use and development should therefore be located at the top management level of the organization in order to ensure a sustainable use across professional borders. Furthermore, as the development and use of MM is resource intensive, organizations should strive to develop models that can be used for more than just one opportunity or at least adapted to new domains easily. This reduces the costs of such models and therefore can help to improve acceptance and foster sustainability [16].

Facilitating long-lasting organizational learning

Organizations only benefit from the findings of maturity assessments if the results are collected centrally and if structured improvement initiatives are derived periodically on the basis of these findings. With regard to the organizational structure of hospitals it is therefore most promising to collect data on management level. This matters especially when cross-sectional assessments are carried out that could reveal detailed improvement potential. Another reason for the localization of responsibility on top management level is the high resource intensity of maturity assessments. Since the budget responsibility for organizational improvements in hospitals is always localized at the top of the organization, resources for assessments, improvements or changes can only be released by management. Furthermore, high staff turnover on department level aggravates a sustainable development of the tool if located on departmental level. However, depending on the type the assessments are performed, and the model is further developed, a close cooperation between the IT department and the hospital management is useful.

4. Conclusion

Not least the increasing need for process orientation in hospitals, the development and use of maturity models for path-oriented improvements has become more and more common in the recent years [12]. MM have become an established and major instrument for guiding organizational change initiatives.

However, the fast-growing number of models can not obscure, that hardly any study on the efficacy of initiated change efforts exist. The need for implementation support in general and for hospitals in specific therefore is very high [12, 20, 24]. Instead, contributions focus more on the development process and address the developers of such models. However, developers are often only involved tangentially in the implementation of MM. In our article, we therefore also focus on challenges from an implementer (i.e. a hospital manager, health policy maker, etc.) point of view.

Besides direct implementation help, we furthermore try to stimulate the scientific discussion on challenges of the implementation of maturity models than on the construction process itself. This in turn could not only increase the appropriateness and effectiveness of such models, but at the same time may lead to new knowledge for the proper construction of MM.

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