Understanding the Main Phases of Developing a Maturity Assessment Model

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Abstract

Practitioners and academics have developed numerous maturity models for many domains in order to measure competency. These initiatives have often been influenced by the Capability Maturity Model. However, an accumulative effort has not been made to generalize the phases of developing a maturity model in any domain. This paper proposes such a methodology and outlines the main phases of generic model development. The proposed methodology is illustrated with the help of examples from two advanced maturity models in the domains of Business Process Management and Knowledge Management.

Keywords

Business Process Management, Knowledge Management, Maturity Model, Design Methodology, CMM

INTRODUCTION

As organizations continually face pressures to gain and retain competitive advantage, identifying ways of cutting costs, improving quality, reducing time to market and so on, become increasingly important. Maturity models have been developed to assist organizations in this endeavour. These models are used as an evaluative and comparative basis for improvement (Fisher 2004; Harmon 2004; Spanyi 2004) and in order to derive an informed approach for increasing the capability of a specific area within an organization (Ahern et al. 2004, Hakes 1996; Paulk et al. 1993). Maturity models have been designed to assess the maturity (i.e. competency, capability, level of sophistication) of a selected domain based on a more or less comprehensive set of criteria. The most popular way of evaluating maturity is a five-point Likert scale with '5' representing the highest level of maturity. Maturity models have proliferated across a multitude of domains since the concept of measuring maturity was introduced with the Capability Maturity Model (CMM) from the Software Engineering Institute (SEI) – Carnegie Mellon. Some examples of existing management models are included in Table 1.

Model	Domain	Key Reference	Developer	Developed
Capability Maturity Model Integration CMMI	Management	http://www.sei.cmu.edu/cmmi/cmmi.html	Carnegie Mellon University	Early 00's
Enterprise Architecture Maturity Model	IT Management	https://www.nascio.org/hotIssues/EA/EAMM.pdf	National Association of State CIO's	Early 00's
European Foundation for Quality Management (EFQM) Excellence Model	Business Management	http://www.efqm.org/Default.aspx?tabid=35	EFQM	Early 90's
Process Maturity Model	Process Management	http://www.rummler-brache.com/	Rummler-Brache Group	Early 90's
Project Management Maturity Model	Project Management	http://www.ogc.gov.uk/sdtoolkit/reference/tools/PMMM_release_v5.pdf	Office of Government Commerce, UK	Early 90's

Table 1: Examples of Management Maturity Models

The CMM has gained such global acceptance that high maturity scores are one of the requirements for accepting off-shoring partners. The SEI has created six maturity models in total and has recently incorporated three legacy CMMs into one maturity model now named the Capability Maturity Model Integration – CMMI (Ahern et al. 2004). Two other stand alone models include the People Capability Maturity Model and the Software Acquisition Capability Maturity Model. However, the SEI is not the only developer of methods to assess maturity. More than 150 maturity models have been developed to measure, among others, the maturity of IT Service Capability, Strategic Alignment, Innovation Management, Program Management, Enterprise Architecture and Knowledge Management Maturity. Unlike CMM which has reached the level of a compliance standard (Mutafelija and Stromberg 2003), most of these models simply provide a means for positioning the selected unit of analysis on a pre-defined scale.

Whilst maturity models are high in number and broad in application, there is little documentation on how to develop a maturity model that is theoretically sound, rigorously tested and widely accepted. This paper seeks to address this issue, by presenting a model development framework applicable across a range of domains. Support for this framework is provided through the presentation of the consolidated methodological approaches, including testing, undertaken by two universities while independently developing maturity models in the domains of Business Process Management (BPM) and Knowledge Management (KM) respectively. Throughout this paper, these models will be referred to as the Business Process Management Maturity (BPMM) model and the Knowledge Management Capability Assessment (KMCA) model. This paper is structured so that the generic phases required for development of a general maturity model are identified first. Next, each phase is discussed in detail using the two selected maturity models as examples. Finally, conclusions are drawn regarding the potential benefits from utilisation of such a model and limitations and future research are identified.

DEVELOPMENT FRAMEWORK

The importance of a standard development framework is emphasised when considering the purpose for which a model may be applied including whether the resulting maturity assessment is descriptive, prescriptive or comparative in nature. If a model is purely descriptive, the application of the model would be seen as single point encounters with no provision for improving maturity or providing relationships to performance. This type of model is good for assessing the here-and-now i.e. the as-is situation. A prescriptive model provides emphasis on the domain relationships to business performance and indicates how to approach maturity improvement in order to positively affect business value i.e. enables the development of a road-map for improvement. A comparative model enables benchmarking across industries or regions. A model of this nature would be able to compare similar practices across organizations in order to benchmark maturity within disparate industries. A comparative model would recognize that similar levels of maturity across industries may not translate to similar levels of business value. It is argued that, whilst these model types can be seen as distinct, they actually represent evolutionary phases of a model's lifecycle. First, a model is descriptive so that a deeper understanding of the as-is domain situation is achieved. A model can then be evolved into being prescriptive as it is only through a sound understanding of the current situation that substantial, repeatable improvements can be made. Finally, for a model to be used comparatively it must be applied in a wide range of organizations in order to attain sufficient data to enable valid comparison. The proposed standard development framework forms a sound basis to guide the development of a model through first the descriptive phase, and then to enable the evolution of the model through both the prescriptive and comparative phases within a given domain. Furthermore, we propose that, whilst decisions within the phases of this framework may vary, the phases themselves can be reflected in a consistent methodology that is able to be applied across multiple disciplines. Figure 1 summarises the phases included in the generic framework.

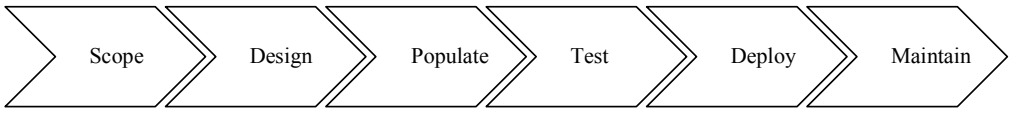

Figure 1: Model Development Phases

Whilst these phases are generic, their order is important. For example, decisions made when scoping the model will impact on the research methods selected to populate the model or the manner in which the model can be tested. In addition, progression through some phases may be iterative, for example it may be a case of 'design', 'populate' and 'test' and dependent upon the 'test' results, necessary to re-visit and adjust decisions made in earlier phases. The usefulness of this lifecycle model is best reflected by showing how it has been applied for the independent development of the BPMM and KMCA models.

Phase 1 - Scope

The first phase in developing a maturity model is to determine the scope of the desired model. The combination of scoping decisions will influence all remaining phases in the proposed generic model development framework. Determining the scope of the desired model will set the outer boundaries for model application and use. The major decisions to be addressed in Phase 1 - Scope are reflected in Table 2.

Criterion	Characteristic			
Focus of Model	Domain Specific		General	
Development Stakeholders	Academia	Practitioners	Government	Combination

Table 2: Decisions when Scoping a Maturity Model

The most significant decision made in this phase involves the focus of the model. Focus refers to which domain the maturity model would be targeted and applied. Focusing the domain will distinguish the proposed model from other existing models. Focusing the model within a domain will also determine the specificity and extensibility of the model. Examples of general models include management models, like EFQM (which considers business excellence) and Total Quality Management (which considers the quality of processes). An example of a popular, more specific model was the CMM which applies to the single process of software development. With the initial focus of the model identified, stakeholders from academia, industry, non-profits and government can be identified to assist in the development of the model. The importance of initially scoping for the development of a maturity model is confirmed by examples from the independent development of the BPMM and KMCA models. Scoping decisions were similar for both the BPMM and KMCA models. The general focus of both models was identified by the selection of specific domains BPM and KM respectively. An extensive review of existing literature in each domain, related domains and maturity models was conducted. Such a review can provide a deep understanding of historical and contemporary domain issues. The review by Rosemann et al. (2004) identified existing models and provided support for developing a more comprehensive model specific to the BPM domain. Existing models either did not adequately capture domain specific issues, complexities and/or had not been rigorously tested. The review also confirmed that academics and practitioners shared a strong interest in the development of a model to fill this gap. Therefore the goal was to develop a model specific to the BPM domain that would assist organizations in better understanding BPM complexities and further to enable the improvement of domain capabilities. The model was initially viewed as a diagnostic tool that would first enable assessment or description of the 'as-is' domain position of an entity. A further aim was to develop the model so that it could be used to assist in the determination of the desired 'to-be' position and enable the development of a roadmap for improving the domain position from 'as-is' to 'to-be'. Furthermore, BPMM researchers were interested in developing a model that would become widely accepted and enable comparative benchmarking with the potential to forming the basis of a global BPM standard. The KMCA research team shared similar experiences when scoping their model. Finally, determining which stakeholders will assist in the model development process is influenced by the model's purpose. For the BPMM, a consortium of academia and practitioners was assembled to provide input from multiple domain perspectives. For the KMCA, a large multi-national firm that comprises multiple independent business units was engaged. Input was obtained from different business units of this firm to insure the broad acceptability of the model.

Phase 2 - Design

The second phase of the proposed framework is to determine a design or architecture for the model that forms the basis for further development and application. Table 3 shows major Phase 2 decisions.

Criterion	Characteristic		
Audience	Internal		External
	Executives, Management		Auditors, Partners
Method of Application	Self Assessment	Third Party Assisted	Certified Practitioner
Driver of Application	Internal Requirement	External Requirement	Both
Respondents	Management	Staff	Business Partners
Application	1 entity / 1 region	Multiple entities / single region	Multiple entities / multiple region

Table 3: Decisions when Designing a Maturity Model

In particular, the design of the model incorporates the needs of the intended audience and how these needs will be met. The needs of the intended audience are reflected in *why* they seek to apply the model, *how* the model can be applied to varying organizational structures, *who* needs to be involved in applying the model and *what* can be achieved through application of the model. To meet audience needs, the model design therefore needs to strike an appropriate balance between an often complex reality and model simplicity. A model that is oversimplified may not adequately reflect the complexities of the domain and may not provide sufficient meaningful information for the audience. Whilst a model that appears too complicated may limit interest or create confusion. In addition, a model that is too complicated raises the potential for incorrect application resulting in misleading outcomes. Within existing maturity models a common design principle is to represent maturity as a number of cumulative stages where higher stages build on the requirements of lower stages with 5 representing high maturity and 1 low. This practice was made popular by the CMM and appears to have wide practical acceptance. The number of stages may vary from model to model, but what is important is that the final stages are distinct and well-defined, and that there is a logical progression through stages. Stages should also be named with short labels that give a clear indication of the intent of the stage. Stage definitions should be developed to expand stage names and provide a summary of the major requirements and measures of the stage, especially those aspects that are new to the stage and not included as elements of lower stages. When defining maturity stages either a top-down or bottom-up approach can be used. With a top-down approach definitions are written first and then measures are developed to fit the definitions. With a bottom-up approach the requirements and measures are determined first and then definitions are written to reflect these. A top-down approach works well if the domain is relatively naïve and there is little evidence of what is thought to represent maturity. The emphasis in this instance is firstly on *what* represents maturity and then *how* can this be measured. In a more developed domain where there is existing evidence on *what* represents maturity, the focus moves first to *how* this can be measured and then builds definitions on this basis. An example of maturity stages defined for the KMCA model is provided in Table 4.

KMCA Stages	Definitions
Level-0: Not Possible	Knowledge sharing is discouraged. There is general unwillingness to share knowledge. People do not seem to value knowledge sharing.
Level-1: Possible	Knowledge sharing is not discouraged. There is a general willingness to share. People who understand the value of sharing do it. Meaning of knowledge assets is understood.
Level-2: Encouraged	Culture encourages sharing of knowledge assets. Value of knowledge assets is recognized. Knowledge assets are stored / tracked in some fashion.
Level-3: Enabled/ Practiced	Sharing of knowledge assets is practiced. Systems / tools to enable KM activities exist. Rewards / incentives promote knowledge sharing.
Level-4: Managed	Employees expect to locate knowledge. Training is available. KM related activities are part of workflow. Systems / tools for supporting KM activities are easy to use. KM capabilities and benefits are assessed. Leadership exhibits commitment to KM and provides KM strategy.
Level-5: Continuous Improvement	KM processes are reviewed / improved. KM systems / tools are widely accepted, monitored / updated. KM assessment generates realistic improvement.

Table 4: Example Maturity Stages of KMCA model

A further consideration when designing a model is how maturity stages can be reported to the audience. Representation of maturity as a series of one-dimensional linear stages is widely-accepted and has formed the basis for assessment in many existing tools. This form of assessment results in an 'average' maturity stage being provided for the entity. Whilst this form of assessment provides a simple means of comparing maturity stages, it does not adequately represent maturity within complex domains, providing little guidance to an organization wishing to improve the 'as-is' position. Alternatively, a 'stage-gate' approach enables the provision of more differentiated maturity assessments within complex domains. A stage-gate approach is achieved by providing additional layers of detail that enable separate maturity assessments for a number of discrete areas, in addition to an overall assessment for the entity. These layers can be represented by the domain, domain components and sub-components. The results obtained from a layered model enable an organization to gain a deeper understanding of their relative strengths and weaknesses in the domain and to target specific improvement strategies thereby enabling more efficient resource allocation. The ability to drill-down through the maturity assessment enables model assessment reports to be tailored to varying needs of multiple audiences.

Figure 2 illustrates how these layers can be matched to the needs of varying audiences within an organization. A domain component (layer 2) is a major, independent aspect of a given domain that is important to domain maturity e.g. critical success factors. Domain components are reflected in general stage definitions and enable clustering of results to model audience. Domain sub-components (layer 3) are specific capability areas within the domain components that provide further detail enabling targeted maturity level improvements. When designing a model the number of domain components and sub-components should be kept low to minimise perceived complexity in the model and ensure the independence of the components. The experience of BPMM researchers indicates 6 components and 5 sub-components are adequate. KMCA researchers used 4 domain components and 6 sub-components.

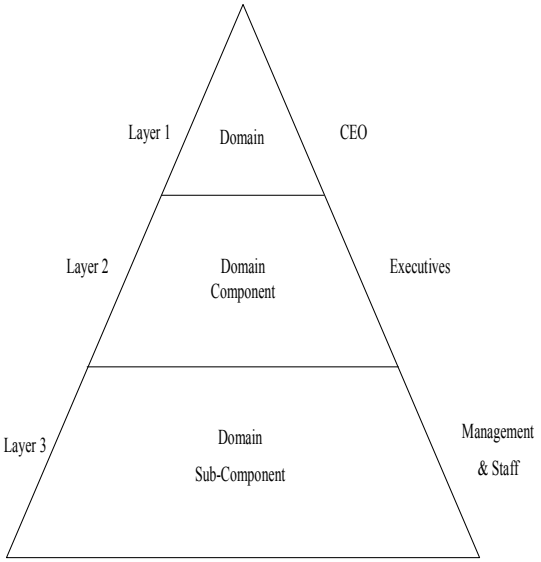

Figure 2: Example of Maturity Model Layers

Phase 3 - Populate

Once the scope and design of the model are agreed the content of the model must be decided. In this phase it is necessary to identify *what* needs to be measured in the maturity assessment and *how* this can be measured. Identification of domain components is critical for complex domains as this enables a deeper understanding of maturity, without which the identification of specific improvement strategies is difficult. The goal is to attain domain components and sub-components that are mutually exclusive and collectively exhaustive. In a mature domain the identification of domain components can be achieved through an extensive literature review. In particular critical success factors and barriers to entry provide great insights into domain components as evidenced by Rosemann and de Bruin (2004). The presence of a rich stream of literature and tested models reduces concerns of whether components are mutually exclusive and collectively exhaustive. Once an initial list has been developed interviews are used to further validate the a priori constructs and increase the already established mutually exclusive and collectively exhaustive list of critical success factors. Confirmation of components selected from multiple evidentiary sources improves the extensibility of the findings of the final maturity model. In a relatively new domain (e.g. Knowledge Management), it may not be possible to gather sufficient evidence through existing literature to derive a comprehensive list of domain components. In this instance, a literature review is considered only sufficient in providing a theoretical starting point and other means of identification is necessary. Figure 3 shows the domain components identified for the BPMM and KMCA models.

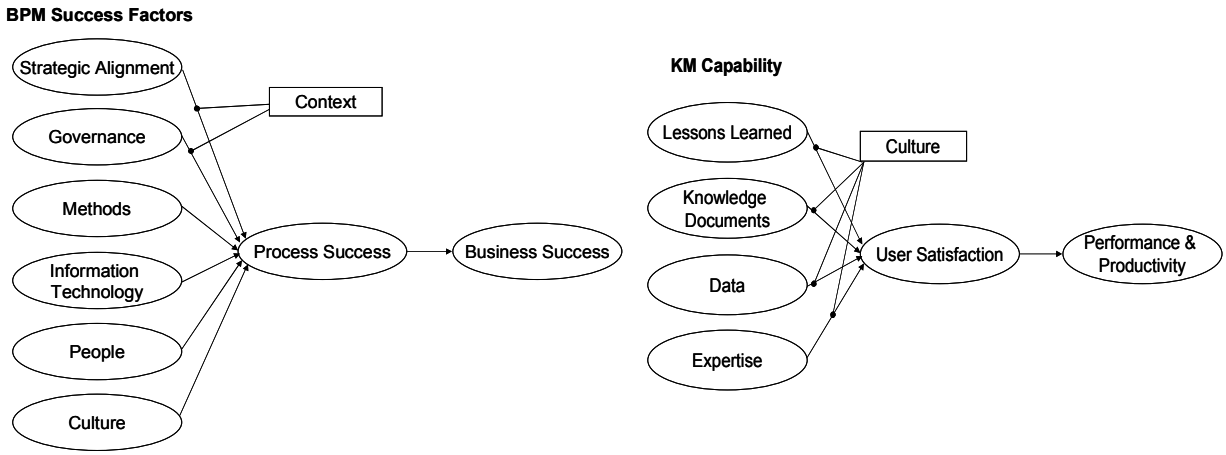

Figure 3: Concept Diagrams for the BPMM and KMCA models

Furthermore, identification of domain sub-components is recommended for complex domains (e.g. Business Process Management and Knowledge Management). This additional layer of detail assists in the development of assessment questions, enables richer analysis of maturity results and improves the ability to present maturity results in a manner that meets the needs of the target audience. It is unlikely that a literature review (no matter how comprehensive) will identify sufficient information to populate this layer of detail. It is recommended that exploratory research methods such as Delphi technique, Nominal Group technique, case study interviews and focus groups be considered. Selection of the most appropriate technique/s will depend on the stakeholders involved in the model development and the resources available to the development team. This is shown by way of example where the BPMM researchers utilized the Delphi technique and KMCA researchers utilized focus groups in the definition and identification of domain components and sub-components.

Although the lapsed time and resources when using the Delphi technique were significant, this method was considered most appropriate for the BPMM model for a number of reasons including: (1) it provided the opportunity to access a broad range of global domain experts; (2) it met existing budget and resource constraints; and (3) it enabled the identification of contemporary issues. The Delphi technique includes the identification and selection of a panel of experts from whom information about a specific topic is solicited through the iterative completion of a number of surveys. Delphi studies are considered beneficial when: (1) dealing with complex issues (Okoli and Pawlowski 2004; Ono and Wedemeyer 1994); (2) seeking to combine views to improve decision making (Bass 1983); (3) in order to contribute to an incomplete state of knowledge (Delbecq et al. 1975); and (4) where there is a lack of empirical evidence (Murphy et al. 1998). The development of a maturity model in a complex domain involves all four of these issues. Furthermore, Okoli and Pawlowski (2004) indicate that the two major areas for Delphi study applications are the traditional forecasting and more recently concept/framework development where studies typically involve a two step process being: (1) identifying and elaborating a set of concepts and (2) classification/taxonomy development. Further insights into the use of the Delphi technique in the development of a maturity model are provided by Rosemann and de Bruin (2005).

For the KMCA model, additional capability areas were identified in association with knowledge life cycle stages. KMCA researchers were working with a single large organization so had a ready supply of available knowledge workers. Population was primarily based on brainstorming sessions, focus groups and pilot/pre testing of the survey instrument. The domain research provided numerous views of these stages of knowledge (Birkinshaw et al. 2002; Satyadas et al. 2001; Zack 1999b). Each domain component was mapped to a four stage acquire/store/present/transfer knowledge life cycle model. Brainstorming sessions were assembled with the client organization in order to provide clarity for each domain component and develop scale items that would capture the stage of the knowledge life cycle. Once it was felt that sufficient coverage was achieved within each domain component, a focus group was assembled in order to determine if the scale items were understandable for the target audience. The focus group consisted of individuals selected from several business units for which the maturity assessment was to be administered.

Each of the methods employed, the Delphi technique and Focus Groups, has differing advantages and disadvantages with the relative importance of these dependent on the context of the scope that has previously been defined. For example, the advantages of Delphi studies include: (1) Anonymity leads to more creative outcomes and adds richness to data (van de Ven and Delbecq 1974; Okoli and Pawlowski 2004); (2) issues inherent in face-to-face groups such as dominant personalities, conflict and group pressures are virtually eliminated (Loo 2002; Murphy et al. 1998); (3) geographic boundaries and associated travel and co-ordination factors are essentially removed (Loo 2002; Okoli and Pawlowski 2004) and (4) duration and cost of study can be minimised (Powell 2003). Whilst these advantages were important to BPMM researchers due to the desire to create a global standard, the KMCA model was developed in conjunction with a single large organization and the engagement required certain deliverables at certain times. As a result, some of the advantages of the Delphi studies were unobtainable or not of particular benefit. Anonymity was not considered important due to the time constraints of the project. While all focus groups and brainstorming sessions were face-to-face, the culture of the organization promoted input by all participating individuals, but inherent issues may have still existed. Geographic boundaries, associated travel, coordination factors and the cost of the KMCA study were minimized due to a single organization engagement. Similarly, there are a number of criticism of Delphi studies including; (1) the flexible nature of Delphi study design (Erffmeyer et al. 1986; Schmidt 1997; Turoff 1970; van de Ven and Delbecq 1974); (2) the discussion course is determined by the researchers (Dalkey and Helmer 1963; Richards and Curran 2002); (3) accuracy and validity of outcomes (Ono and Wedemeyer 1994; Woudenberg 1991). Whilst the global nature of BPMM model development meant the use of Delphi studies was preferred, researchers worked to minimise inherent disadvantages. Similar criticisms exist for the conduct of focus groups and KMCA researchers also took action to minimise impact.

The important issue when populating the model is to select the combination of research methods that is most appropriate for model development in the context of earlier scoping decisions and desired model outcomes. By

way of example, domain components for the BPMM model were identified through an extensive literature review with the resultant list validated through interviews and case studies in two organizations. Rosemann and de Bruin (2004) provide insights into both the use of an extensive literature review and the subsequent application of the BPMM model in two case studies. Rosemann and de Bruin (2005) explains how the Delphi technique was then used to further define sub-components by seeking input from domain experts from various domain perspectives. This process identified a range of contemporary global BPM issues and contributes to developing a model that has wide practical appeal and potential for a global standard. Figure 4 depicts the outcomes achieved with respect to BPMM model development.

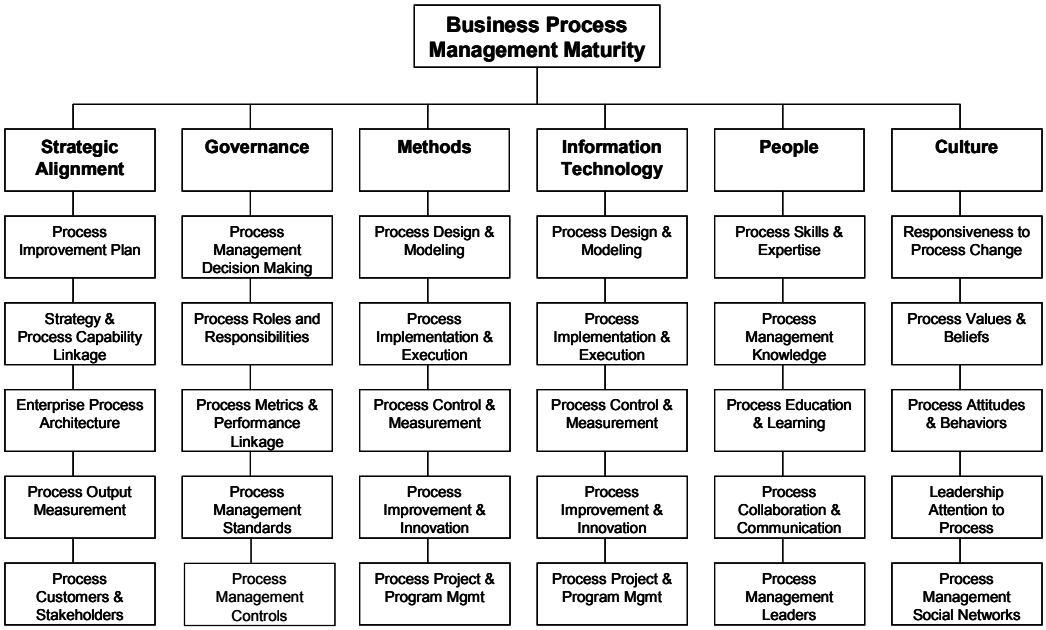

Figure 4: Domain, Components and Sub-Components of the BPMM model

Next it is necessary to determine how maturity measurement can occur i.e. the instrument/s used in conducting an assessment and the inclusion of appropriate questions and measures within this instrument. When selecting an instrument for conducting an assessment consideration needs to be given to the model generalisability together with resources available for conducting assessments. A quantitative method such as a survey that can be made available through electronic means is recommended. Use of a survey that incorporates quantitative measures enables collection of results that enable consistent statistical analysis and improves comparability of results. Delivery and collection of survey by electronic means makes the survey easily distributable to a wide range of respondents across geographic boundaries. Furthermore, electronic delivery and collation aids in reducing the costs associated with survey distribution and increases the reliability of responses by removing the need for re-keying. With respect to determining the questions, the domain components and sub-components provide good guidance. A review of existing literature can result in a comprehensive list of questions. Another alternative is to use questions that have previously been determined and used in another form. The use of Likert scales (or similar) can improve reliability and consistency of response and enables results to be easily mapped to maturity stages. It is important that questions and responses are valid i.e. that they measure what it is they are intended to measure. In addition, a balance in the number of questions is important. Sufficient questions are required to ensure complete measurement but too many questions may reduce reliability of data by resulting in a reduction in total survey responses or an increase in incomplete surveys. The structure of the survey can assist in this endeavour. Depending on the intended respondent it is possible to structure the survey for different results. For example, the BPMM survey was designed in discrete sections with each section being completed by an expert in the domain component. In this case it is possible to increase the number of questions asked resulting in greater insights into the domain component but limiting the number of respondents (and therefore the ability to generalize) within the unit of analysis. Alternatively, the KMCA survey was designed to be completed by a large number of individuals (thereby increasing the ability to generalize) within the unit of analysis but resulting in a less comprehensive understanding of the domain component as fewer questions were asked of a more general respondent.

Whilst the methods employed for populating the model may vary from case to case, the use of complementary research methods in the identification of independent and relevant content assists in developing a soundly constructed model that can be further tested.

Phase 4 - Test

Once a model is populated, it must be tested for relevance and rigor. It is important to test both the construct of the model and the model instruments for validity, reliability and generalisability.

Construct validity is represented by both face and content validity. Face validity is assessed by whether good translations of the constructs have been achieved. Such validation is assessed during the population of the model using such tools as focus groups and interviews. The maturity model should be considered complete and accurate with respect to the identified scope of the model. Selecting complementary methods for populating the model will assist in achieving face validity. Content validity is assessed as to how completely the domain has been represented. The extent of the literature review and breadth of the domain covered provides a measure of content validity. Once the initial maturity model has been judged complete, an inter-rater reliability pilot test can be initiated in order to improve the convergence of opinions that desired design objectives have been achieved. These initial steps for construct validity are critical to insuring that the theoretical basis of the model is sound. The construct of the BPMM was tested by application in case studies, incorporating surveys and interviews, conducted with two organizations in different industries. Tools such as case study protocols, the inclusion of quantitative measures within surveys and the use of the same researchers throughout the studies were used to improve reliability of data gathered. For the KMCA, initial construct testing was accomplished by way of pilot testing undertaken with a portion of one organizational business unit to determine model acceptability. Subsequent brainstorming sessions and a pre-test of the model identified the need to assemble a focus group for each business unit to further assess model instruments. Focus groups for each organizational business unit were assembled in which the model was to be applied. The purpose and design of these groups was to insure the understandability and relevance of the subsequent instrument.

In addition to testing the model construct, it is necessary to test any assessment instruments for *validity* to ensure they measure what it was intended they measure and *reliability* to ensure results obtained are accurate and repeatable. In both models, the assessment instrument was a maturity assessment survey. BPMM survey questions were validated by referencing existing literature and by seeking agreement within a selected group of domain experts. The small number of survey respondents within a given unit of analysis made pilot-testing difficult, resulting in questions being testing through application of the survey in two organizations. Respondents were asked to comment on survey structure, ease of survey completion, time for completion and perceived completeness of the questions. KMCA questions were validated by utilizing portions of a previously validated instrument. Additionally, due to the large population available for survey administration, factor analysis was able to be utilized to insure convergent and divergent validity (Freeze and Kulkarni 2005). Also, as the KMCA survey was being administered to a large population, a pilot group for testing the survey was considered critical. Pilot groups were used to pre-test the survey instrument with the goal of insuring the relevance of the survey instrument and providing appropriate examples within the organization or business unit that relate to the domain components. The pilot group was selected to include individuals from the population to be assessed.

Whilst the manner in which testing is undertaken can vary between models, inclusion of this phase in a generic framework is supported by the vital role testing played in the development of the BPMM and KMCA models.

Phase 5 - Deploy

Following population and testing, the model must be made available for use and to verify the extent of the model's generalisability. To whom it is made available and in what manner can be addressed in two steps that will provide wider acceptance and improve the standardization of the model. Deployment includes issues such as initial organizational application and can consider the design collaborators as primary respondents. Where the model has been developed and tested utilising the resources of an involved stakeholder (i.e. an industry, non-profit or government entity) it is likely that the initial application of the model will be with this stakeholder. This is the first step in determining the critical issue of model generalisability and can lead to general acceptance of the model. However, until the model has been deployed to entities independent of the development and testing activities, generalisability will continue to be an open issue irrespective of whether the model has been developed for a specific domain or for general application. Moving to the second step in deployment, it is necessary to apply the model within entities that are independent of the model development. For models that were developed for specific domains where single organizational stakeholders were involved, the identification of similar firms in different markets may supply the list of potential "next" administrations. For models developed in general domains where multiple organizational stakeholders existed, the use of consortiums for further application may be appropriate. Depending on the original scope of model application, selection of a range of entities on the basis of industry, region, sector, financial resources and employee numbers will assist in improving the generalisability of the model. The identification of organizations that may benefit from future

application of the maturity model and the ability to apply the model to multiple entities provides the final steps towards standardisation and global acceptance of the developed model.

Phase 6 - Maintain

The goal of the maturity model impacts greatly the resources necessary to maintain the model's growth and use. Success in establishing the generalisability of the model requires that provisions be made to handle a high volume of model applications. This will necessitate some form of repository in order to track model evolution and development. Evolution of the model will occur as the domain knowledge and model understanding broadens and deepens. A model that provides prescriptive actions to improve maturity must have the resources available to track interventions longitudinally. This capability will further support the model's standardization and global acceptance. The availability of resources to undertake such maintenance will also be determined to some degree by initial scoping. For example, if a model is made available via a web-interface, resources will be required over time to ensure the interface is updated to reflect changes in the underlying assessment tools. If software is developed to make the model available to consultants for third-party assisted application, software developers will need to update versions to reflect changes in the domain and technology. If globalisation of the model is achieved and certification of model appliers is required issues such as training material, certification processes, and so on will need to be considered.

The continued relevance of a model will be ensured only by maintaining the model over time.

CONCLUSIONS

This paper has proposed a generic methodology for the development of maturity models in various domains. The value in a generic methodology lies in the ability to develop a model that is highly generalisability and enables standardization. Use of a standard methodology enables a stable state of model development to be reached and for incremental improvements to be made over time. The benefits to a domain of a model that is both well-founded and well-based include: having an ongoing source and accumulation of domain knowledge, improving sustainability as organizations are better equipped for domain success and better understanding relationships and influences that impact the domain. The value to organizations of applying such a model lies in the ability to measure and assess domain capabilities at a given point in time. This provides an organization with a better understanding of existing domain capabilities, enables benchmarking against a range of competitors, enables greater efficiency in the utilization of resources in improving domain capabilities and presents an opportunity for improved success in the domain.

Limitations & Future Research

The proposed development framework is limited in that it is supported by the experiences of researchers of only two models in the domains of Business Process Management and Knowledge Management respectively. Application and support of the development framework by researchers in other domains will provide additional insight into the relevance and usefulness of the proposed framework. The BPMM and the KMCA models are subject to ongoing research. Future experiences from this research will be incorporated into the proposed model development framework.

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