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Iterative Development of Professional Knowledge Intensive Business Processes

Norbert Gronau
Chair of Business Information Systems and Electronic Government University of Potsdam, norbert.gronau@wi.uni-potsdam.de

Priscilla Heinze
Chair of Business Information Systems and Electronic Government University of Potsdam, priscilla.heinze@wi.uni-potsdam.de

Julian Bahrs
Chair of Business Information Systems and Electronic Government University of Potsdam, julian.bahrs@wi.uni-potsdam.de

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Norbert Gronau
Chair of Business Information Systems and
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University of Potsdam
norbert.gronau@wi.uni-potsdam.de

Priscilla Heinze
Chair of Business Information Systems and
Electronic Government
University of Potsdam
priscilla.heinze@wi.uni-potsdam.de

Julian Bahrs
Chair of Business Information Systems and Electronic Government
University of Potsdam
julian.bahrs@wi.uni-potsdam.de

ABSTRACT

Knowledge related aspects of businesses processes are often ignored or referred to as a black box in process improvement projects. As a result they remain untouched and it is left to the knowledge workers to establish routines and workflows that deliver results needed to fulfill the business processes needs. This often results in lowered efficiency, redundancy of knowledge related activities, lack of systematic knowledge sharing and maintaining and insufficient support for knowledge workers.

In this paper we introduce goals and practices as well as criteria to monitor the degree of achievement for such processes. We connect these to a maturity model for knowledge intensive business processes, which is used to assess and improve quality of knowledge intensive processes. It can be used during process improvement projects as well as for a self assessment.

Keywords

Knowledge intensive business processes, good practice, maturity assessment models.

INTRODUCTION

Many companies have been integrating knowledge management strategies into their corporate aims and policies. Approaches and methods for organizing, evaluating and maintaining knowledge and its environment have been implemented and measures for improvement have been undertaken. As investments in various knowledge management procedures expand, the need for measuring the quality of these knowledge management implementations as to which extent they fulfil certain requirements also increases. Multiple maturity level assessment models have been developed. Some models focus on the practices of knowledge management in the whole company, independent of the business processes (Humphrey 1989, Berztiss 2002, Ehms and Langen 2002). While the companies are provided recommendations on how to progress the maturity level, these are not bound to processes and therefore are difficult to control. Some others concentrate on the integrated implementation of knowledge management in each business process (Paulzen et al. 2002, El Emam et al. 1998). While these models offer a more intensive analysis and precise verification of the maturity levels, they are lacking a method to describe and visualize the objects of knowledge intensive business processes, which is crucial to investigate the maturity level systematically. In addition, the existing approaches have failed to define the framework that leads to the determination of which knowledge management tasks should be completed in which kind of situation and which quality standards are expected in completing these tasks.

Our model examines the actual state of implementation of knowledge management tasks within the process as well as in the whole company, rather than whether or not some certain knowledge management activities are being carried. KMDL as method to prepare the needed data to generate the factors and indicators set allows the visualization of knowledge and information objects and their allocation within the process. This way, the knowledge and information flow within a process and between processes can be comprehended and, if needed, improved.

In this contribution we introduce the artifact which resulted from the design science research process. We show results from the theory triangulation of three different kinds of existing maturity models in the second chapter. Prior we describe our

research design. The improved maturity model, which is developed based on the findings and which has already been validated with a few SMEs is introduced in chapter three.

METHOD OF RESEARCH

Triangulation originates from the social science. Denzin (1978) categorizes triangulation into four types: (1) data triangulation, which combines various types of data to be gathered, (2) investigator triangulation, which involves multiple researchers in the research, (3) theory triangulation, which uses more than one theoretical basis to interpret an observed fact, and (4) methodological triangulation, which combines more than one method for data gathering and analysis. In this paper, we combine literature research and design science research as methods. Therefore, a methodological triangulation is used.

A literature research is a "systematic, explicit and reproducible method for identifying, evaluating and synthesizing the existing body of completed and recorded work produced by researchers, scholars and practitioners." (Fink 2009, p. 3). This secondary method of research is necessary in order to establish the foundation of concept, which is used at later phases to set the patterns and frameworks of examinations. Based on the found results, we use the design science research to construct the proposed maturity model.

The design science research is basically a problem-solving paradigm, as concluded by Hevner, March, Park, and Ram (2004). This research method has been intensively and widely used in the german-speaking information system community in many forms of disciplines (Wilde and Hess 2007). Hevner et al. (2004) define design as a description of the world as *processes* and *artifacts*. March and Smith (1995) categorize them into two processes (*evaluate* and *build*) and two artifacts (*constructs, models, methods* and *instantiations*). In solving problems, artifacts are *built* and *evaluated* in order to improve both the quality of the artifact and the process. These processes iterate a number of times until a final artifact is produced (Markus, Majchrzak, and Gasser, 2002). *Constructs* provides the means to communicate and define problems and solutions as well as to enable the representation of a real world situation, which is a *model* (Simon 1996). *Methods* supply a manual to solve problems. They can range from approaches, algorithms, "best practices", and more (Hevner et al. 2004). *Instantiations* are the evidence of the working application of the constructs, models and methods.

Hevner et al. (2004) suggest seven guidelines for design science research while the extent of implementation of the guidelines is left to the researchers' own judgment. We summarize our research procedures in Table 1 in coherence to the mentioned guidelines and their descriptions.

Guidelines	Description	Research Practices
Design as an Artifact	A viable artifact as product of research	Our design science research produces the artifact in form of a maturity level assessment model, which also serves as a method recommendation for a continuous improvement for business processes.
Problem Relevance	A technology based solutions as objective of the research	One of the solutions strived within this project research is the development of a computer-aided self assessment tool based on the maturity model, which is designed specifically for small and medium enterprises (SME).
Design Evaluation	Execution of evaluation methods to prove the results' utility, quality and efficacy	The maturity model was validated by a panel of experts in knowledge management and business processes as well as the project based working group, consisting of ca. 10 SME.
Research Contributions	Clear and verifiable contributions in the areas of the design artifact, foundations, and methodologies[1]	Improvement measures are deduced from the assessed maturity level of the business processes. The maturity model itself contributes a design artifact, the value system to calculate the maturity level and the conditions to be fulfilled at each level are both the foundations and methodologies contributions.

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[1] Hevner et al. (2004) categorize research contributions into (1) the design artifact itself, (2) foundations for further researches such as design algorithms, innovative information systems, etc. and (3) methodologies for development and evaluation. They suggest that at least one of these contributions should be found in the research project.

Research Rigor	Application of rigorous methods in the construction and evaluation of artifacts	In constructing the maturity model, we adhere to the rigorous concepts of quality management. Our maturity levels are adjusted from the SPICE model, also known as ISO 15504[2], which is an international standard model for maturity level process assessment.
Design as a Search Process	Utilization of available means to reach desired ends while satisfying laws in the problem environment	We created a maturity model prototype including some success factors and indicators as prerequisites of each maturity level. This prototype and the suggested indicators were iteratively validated by the expert panel and the project working group and upgraded until a satisfactory result was reached.
Communications of Research	Presentable results for both technology oriented as well as management oriented audiences	Our working group consists of both technology oriented as well as management oriented audiences. They act as practitioners, who would use the maturity model to assess their companies, but also as investors, who would invest resources in implementing the improvement recommendation.

Table 1. Research Practices based on the Guidelines for Design Science Research by on Hevner et al. (2004)

As it turns out, our research methods fulfilled the seven guidelines assembled by Hevner et al. (2004). A chronological course of action of the project will be explained in section 4. The next section will explain our literature research findings.

REVIEW OF EXISTING MATURITY ASSESSMENT MODELS

In the course of our literature research, we have identified several existing maturity assessment models. These models are categorized into three groups, depending on the subject of assessment, which are the business processes, the knowledge management or the knowledge management in business processes.

Maturity Models of Business Processes

The most popular process maturity model is the Capability Maturity Model (CMM), which was developed at the Software Engineering Institute (SEI) and owned by the Carnegie Melon University aiming to improve software development processes (Humphrey 1989). It defines the maturity levels as initial, repeatable, defined, managed and optimized. Slightly adjusted, the Capability Maturity Model Integration (CMMI) was developed based on CMM. CMMI seeks to assess and improve the quality of processes in three different areas: (1) product and service development, (2) service establishment, management and delivery and (3) product and service acquisition. The slight adjustment of CMMI takes place at the definition of the maturity levels, namely initial, managed, defined, quantitatively managed, and optimizing (SEI 2010). CMM and CMMI are later used as basis for many emerging maturity models.

As such, the Process Management Maturity Assessment (PMMA) was developed by Siemens AG as an element of the Siemens Process Framework. It uses CMMI's maturity level definitions, though assigns different maturity criteria, and determines 9 scopes of process to be assessed. The application of PMMA is company specific, since it assesses the compliance of Siemens' business process management activities with the Siemens Process Frameworks standards (Rohloff 2009). The advantages of this model, as pinpointed by Rohloff (2009) is its comprehensive scope of assessment, which "covers all relevant factors of Business Process Managements" (p. 141) and its ease of use. However, he also criticizes its consolidation of criteria for each maturity level and suggests detailed views of each of the nine criteria.

Jugdev and Thomas (2002, p. 6) summoned some shortcomings of the CMM-based maturity models. It ranges from the models being concentrated only on identifying problems but not on solving them, the models being "overly disciplinary, impractical and overwhelming as methodologies", models focusing only on processes and neglecting the human resource or organizational aspects, etc. Another product of SEI, the People Capability Maturity Model (P-CMM), was developed in order to address the last shortcoming. P-CMM assesses software development processes from the people point of view, namely the employees and leaderships. A slight adjustment takes place in the second and fourth maturity level definition. The levels in

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[2] SPICE (Software Process Improvement and Capability Determination) model belongs to the ISO, which stands for International Standard Organization. (El Emam, Drouin, Melo 1998)

P-CMM are called initial, managed, defined, predictable and optimizing. This model does not assess the maturity level of the organization's personal but the existence of certain structures that contribute to the development of the people in the organization, such as trainings and further education, development and control of competence, participative culture, and more (Curtis, Hefley, and Miller 2002).

In Europe, the European Foundation for Quality Management (EFQM) Model developed by the organization with the same name is widely employed. The model consists of 9 main criteria, categorized as *enabler* and *results*. The assessed companies can join organized competitions, such as the EFQM Excellence Award or the German Ludwig-Erhard prize. To participate, companies have to strive to fulfill the defined criteria. Their success is assessed by *assessors,* which are EFQM trained auditors. Based on the quality achievement of the processes, the companies are given assessment points. There is also the option of self assessment, which enables the companies to critically evaluate their own processes as primary actors (EFQM 2010). Because of its widespread application, the EFQM model has become the standard quality model of ISO 9004. ISO 9004 is one of the standards in the ISO 9000 family, which is dedicated to the quality of processes. ISO 9004 itself has five maturity level criteria: no formal approach, reactive approach, stable formal system approach, continual improvement emphasized, and best in class performance (EN ISO 9004:2009).

All of these models do not have the ability of assessing single business processes. The maturity level criteria apply for the whole organization or single business units. A detailed process oriented point of view has been left out. The initiation of the project for Software Process Improvement and Capability Determination (SPICE) addresses this need. Assessed in SPICE are the process dimensions, which are the types of process being executed. For example: the costumer oriented as process type includes the sub-types customer acquisition, software delivery, etc. This way, single business processes can be assessed. Nine process attributes are then defined to measure the attainment of the maturity levels. Table 2 describes the maturity levels of the SPICE model.

Maturity	Process attributes	Description
0 - Incomplete	None	-
1 - Performed	PA 1.1 Process performance	The desired results are developed and the process objectives are reached
2 - Managed	PA 2.1 Performance Management	The defined time target and resource limits are adhered to
	PA 2.2 Work product management	The desired results are documented and controlled
3 - Established	PA 3.1 Process Definition	The implementation of the process is based on a standard process scheme
	PA 3.2 Process Deployment	The process participants are competent employees and an adequate infrastructure is provided
4 – Predictable	PA 4.1 Process Measurement	The implementation of the process is evaluated quantitatively
	PA 4.2 Process Control	The measured data is analyzed and used for the process controlling
5 - Optimizing	PA 5.1 Process Innovation	The impacts of changes in the standard process scheme are measured and used for later and further adjustments
	PA 5.2 Process Optimization	The potentials for process improvement are periodically reviewed and implemented

Table 2. SPICE Maturity Model (based on El Emam et al., 2006)

The first step taken by the SPICE Model in looking deeper into single business processes has been an inspiration for the development of later maturity models. However, it is difficult to set the correlation among the process attributes in coherence with the ascending maturity level. For example: it is not clear why PA 3.2 Process Deployment marks a lower maturity level than PA 4.1 Process Measurement. Hence, this model needs to establish a stronger relationship in defining the maturity level criteria.

Maturity Models of Knowledge Management

Most maturity models of knowledge management are based on the CMM-Model as well. Infosys developed the Knowledge Management Maturity Model (KMMM) that incorporates the people, process and technology points of view. The objects of assessment are the stages of the knowledge life cycle, namely knowledge acquisition, knowledge dissemination and knowledge reuse. Its maturity levels include default, reactive, aware, convinced and sharing. The prerequisites to be fulfilled in each level are elaborated as key result areas from each point of view. For example: for the maturity level 3 (aware) the (1) central knowledge organization and (2) knowledge education are key result areas from the people point of view. These attributes for these key result areas are defined as such: dedicated knowledge management group for infrastructure management and content management (for the key result central knowledge organization) and training in knowledge management processes for knowledge management group (for the key result knowledge education). The categorization of the knowledge management processes in people, process and technology points of view and the definition of key result areas enable multiple perspectives of assessment (Kochikar, 2000).

Another attempt to adjust the CMM-Model for knowledge management was performed by Berztiss (2002). He developed the Capability Maturity for Knowledge Management (CMKM) by suggesting knowledge management and knowledge engineering related key process areas to the existing maturity levels. Hence, the CMM based maturity levels are added some more requirements such as uncertainty awareness for level 2 (repeated) and user access and profiling as well as knowledge representation for level 3 (defined). Starting from level 4 (managed) through, the levels are called "advanced level" (Berztiss 2002, p. 166). Both Infosys' KMMM and Berztiss' CMKM have managed to identify the key factors of knowledge management. However, the ascending character of the key process areas in each maturity level is not clearly defined nor justified.

An assessment model developed by Siemens AG carrying the same name like Infosys', the Knowledge Management Maturity Model (KMMM) is also based on the CMM-Model. It has four perspectives (time horizon, knowledge, actor and rules) and key distinctions (strategic vs. operative, external vs. internal, people vs. technology, informal vs. formal). The eight key areas, which are the objects of assessment, are based on the assessment criteria of the EFQM model. While the maturity levels remain the same, the fulfillment criteria were adjusted to represent knowledge management specific aspects (Ehms and Langen 2002). This model provides the possibility to gradually examine the maturity levels of each key area, however not the single business processes.

More maturity models were found in the literatures (Teah, Pee and Kankanhalli, 2006; Paulzen et al. 2002; Rohloff 2009). Teah et al. (2006) also discuss non-CMM based knowledge management maturity models. They find that although these models have similar structures to the CMM-based models, the levels are named and defined differently so that "extracting common characteristics to summarize these [knowledge management maturity models] is less feasible and less likely to be accurate and representative" (Teah et al. 2006, p.405).

Maturity Models of Knowledge Management in Business Processes

Assessing knowledge management activities at business process level bring the advantage that their analysis can be conducted in a more detailed and structured manner. Paulzen et al. (2002) also mention the possibility of assessing the impact of these activities on the corresponding business processes. Recognizing this, Moore (1999), Pavlou, Housel, Rodgers and Jansen (2005), Roy, del Rey Chamorro, van Wegen and Steele (2000) and Paulzen et al. (2002) developed knowledge management maturity models based on business processes.

Moore (1998) measures the performance of a knowledge work project in terms of its productivity, delivery and defect density. He defines knowledge work as a task of producing and selling knowledge instead of manufactured product. The raw material of a knowledge work process is the information and the knowledge in the mind of its knowledge workers, which are the employees executing the tasks. He developed the knowledge work metrics to evaluate its performance by calculating certain indicators, such as the time and amount of effort needed to complete a project.

Another quantitative measurement method was developed by Pavlou et al. (2005) in their Knowledge Value-Added approach. They suggest that the knowledge value added can be calculated based on the amount of change that is performed on a business process when producing a product. In order to calculate the amount of change, the *learning time* parameter is proposed , in which the amount of time needed to learn (or to receive and internalize knowledge) is calculated and compared to the knowledge cost, or Return on Knowledge (ROK). Both methods produces solid quantitative results and enable a direct cause and effect analysis. However, due to the intangible and person-bound nature of knowledge, the metrics and parameters used to calculate the performance levels are not necessarily practicable for all cases. Distinctive business strategies and company specified indicators are not taken into consideration.

Aiming to close the gap between the strategic and operational level of the existing performance measurement systems, Roy et al. (2002) develop the Knowledge Management Performance Measurement Framework. After defining and formulating the business strategy, they include the indicators suggested by Kaplan and Norton (1996) in the Balance Scorecard method. The main focus of the framework is the identification of the knowledge process outcomes, their impact on the business process and the generation of measurable actions based on the business process attributes found earlier. While this framework enables the development of performance indicators based on the business process and business strategies, Paulzen et al. (2002) pinpoint its lacking of measurement of necessary knowledge management structures.

On attempt to address these shortcomings, Paulzen et al. (2002) develop the Knowledge Process Quality Model (KPQM). It has four aspects, namely the maturity stage dimension, the knowledge activity dimension, the management area dimension and the assessment structure. The maturity stages of this model consist of initial, aware, established, quantitatively managed and optimizing and are directed towards knowledge processes, a set of knowledge activities. The knowledge activity dimension consists of all kinds of activity instances, such as identifying, generating, using knowledge, etc. The management area dimension comprises of the organization, people and technology points of view, which are assigned process attributes as the assessment structure. These attributes are then refined into each knowledge activity performed within these attributes. KPQM allows a very thorough assessment of knowledge activities in single business processes considering a comprehensive scope of organization aspects. Apart from that, Paulzen et al. (2002) suggest the implementation of the framework by Roy et al. (2002) in order to determine suitable measures for the business process. Nevertheless, KPQM fails to show the ascending level of quality of the knowledge activities basing only on its process attributes. His model also generalizes the maturity level indicators of companies at any size. This results in disadvantages for SME.

PROPOSED MATURITY LEVEL MODEL FOR KNOWLEDGE INTENSIVE BUSINESS PROCESSES

Ehms and Langen (2002) suggest the prerequisites that a maturity model should fulfill. The model should:

1. be applicable to different objects of analysis, e.g. organizations as a whole, as units or knowledge management systems

2. consider the views of different participants.

3. provide a systematic and structured approach which ensures transparency and reliable handling of the assessment procedure.

4. provide qualitative and quantitative results

Paulzen et al. (2002) add the importance of continuous learning and improvement to the prerequisites. Teah et al. (2006) attempt to fulfill these requirements by developing General Knowledge Management Maturity Model (G-KMMM). Its implementation, however, has not overcome the shortcomings found by the above existing models. Therefore, based on these prerequisites and the findings on the shortcomings of the existing maturity models, we developed an assessment model for the maturity level of knowledge intensive business processes. This model is a product of a collaboration project financed by the German Federal Ministry of Economics and Technology.

Success Factors and Indicators

The proposed maturity model categorizes its indicators into 9 key process areas (KPA), most of which are derived the EFQM model. These are leadership, politic and strategies, partnership and resources, process design, knowledge transfer, employees, information system, and process-specific areas. Each KPA is assigned several success factors. While these success factors also consist of process and quality management related success factors in the collaboration project, this paper only discusses the knowledge relevant success factors and their indicators. The fulfillment of these factors is marked by the defined indicators. Principally, the success factors represent the assignments of knowledge management as suggested by Gronau (2009) in his Potsdam Knowledge Management Model. He lists out 11 assignments that should be performed when managing knowledge. In our maturity model, these assignments are partially adjusted based on the point of views of each KPA and their realizations described according to the related maturity level. The levels of maturity used in the proposed model are derived from the classical CMM-Model, namely initial, repeated, defined, managed and optimized (see **Error! Reference source not found.**).

The knowledge oriented success factors include:

- Securing collective knowledge usage

A company should ensure the willingness of its employees to use and commonly share the available individual and organizational knowledge. This can be done by encourage the knowledge diffusion by controlling the dissemination (direct influence) or by a self organized dissemination through the employees themselves. Professional trainings can be offered as a push mechanism for controlled knowledge dissemination. The company can support a self organized knowledge dissemination by providing a suitable infrastructure that enables access for information and communication channels, like providing newspaper subscriptions (pull mechanism).

- Knowledge strategy is part of the company strategies

Knowledge strategy describes the values of knowledge in the company. It also describes the measures to preserve and expand the individual and organizational knowledge as well as the adequate financial, technical and organizational expenditures. Knowledge strategy has medium until long term validity. Knowledge management tasks can be derived from the constituted knowledge strategies. The fulfillment requirements of the strategies are set according to the aim of the company as well as the single units and individuals.

- Process and company relevant knowledge evaluation

The evaluation of knowledge categorizes each knowledge domain according to certain characteristics (for example: frequencies of usage, application in which processes, amount of employees bearing this knowledge, etc.). The evaluation of these characteristics concludes the value of knowledge in the process as well as in the company. Knowledge strategies serve as the benchmark of the evaluation, which enables the identification of which knowledge to be nourish and which to be disregarded since it does not contribute to the company's value creation.

- Identification of knowledge and its use

This factor deals mainly with the recognition and description of the internal and external knowledge. Internal knowledge consists of the individual knowledge of the employees and the organization knowledge of the company. External knowledge is the interorganizational knowledge of the partners of the value creation process. It is also crucial to differentiate tacit from explicit knowledge. Understanding own and available knowledge and its use contributes to an easier identification of knowledge deficits and the subsequent acquisition. Apart from that, these identified knowledge sources should be made accessible for the concerned parties.

- Identification of knowledge deficits

Meant by knowledge deficit is the lacking of explicit and tacit knowledge required by an individual to accomplish a task. There is a deficit of knowledge if a process requires this certain knowledge to be implemented or if a significant qualitative improvement can be yielded. Knowledge deficit can be categorized into two types: (1) non-recurring knowledge deficit, which appears seldom and cannot be planned, and (2) recurring knowledge deficit, which occurs at every implementation of a knowledge intensive business process.

- Knowledge acquisition

After the knowledge deficit is recognized, it can be acquired internally and externally. Internal knowledge acquisition can be performed through a user manual, professional training, case studies, experiments, and other organization internal activities. External knowledge acquisition can be obtained from consultants, service companies, etc.

- Knowledge and information storage and maintenance

A structured and systematic maintenance and supply of knowledge is decisive to preserve knowledge. The sustainability of knowledge should be secured by assuring its reusability, not only within a process but also between processes and process instances. However, the storage alone is not enough. Knowledge needs to be regenerated, exchanged and deleted every period of time in order to avoid redundancies and duplication of works. Knowledge that are no longer up to date should be refreshed or renewed. Irrelevant knowledge should be archived or deleted when possible.

- Identification and removal of knowledge barriers

Knowledge barriers to be identified are all events that lead to a restricted use and processing of knowledge. They can be the low intensity of use of information system, which is caused by technology illiteracy or fear of new technologies, or insufficient practical explanation. In order to remove these knowledge barriers, the management should provide a solid structures, systematic operational course of actions and systematic systems that will improve

the intensity of knowledge usage. Types of leadership, the attractiveness of knowledge offers, the obtained advantages, the organization culture as well as the incentives play an important role for removing the knowledge barriers.

For the KPA *Leadership* is *securing collective knowledge usage* the first success factor. Leading positions can be heads of department or managers. The indicators for each of the maturity level are to be fulfilled by the leading positions. There are 4 alternative answers, namely does not apply (0%), partially applies (25%), mostly applies (75%) and fully applies (100%). For example: when the condition fully applies that the knowledge bearers (which role holds which decision competence) and the content of knowledge (norms are available as handbook, templates are available on the intranet) are defined (L.d.1) and certain medium types (wiki, forum, bulletin board) is defined and its use is even enforced (L.d.2), then the evaluated company's process in terms of its *Leadership* KPA obtains the maturity level 3 (defined) in *securing collective knowledge usage*.

The other KPA are structured similarly. For the KPA *Process Design, Employees* and *Information System* no knowledge related success factors were developed. *Process Design* lists out the requirements from the process management discipline, while *Employees* deal with the motivation and acceptance of employees within the process. *Information System* covers the availability of technology for daily tasks executions and its intensity of usage. The first 8 KPA apply for all kinds of process, in which only one process is to be evaluated at once. The eighth KPA is process oriented and can be expanded at will. Within the scope of this project, we investigated the product development process. The next step would be to identify the specific success factors and indicators of this particular process.

Application of Method / Project Procedure

Taking the role as supervisors as well as representatives of the industry, a working group within this project was founded. Around 10 companies, 6 of them SME, are members of this project group. We investigated the product development process of two companies within this working group using the KMDL method in order to gain the first insights of how a product development process look like in the practice. The results of this investigation are exhaustive process models representing the currently performed product development process of the companies. At the same time, we did a literature research on knowledge-related success factors in general as well as in the product development process particularly. The produced models were then analyzed and compared with the results of the literature research. Using the potential analysis offered by KMDL we identified some shortcomings in the investigated processes. These are cross-checked with the relevant companies. We presented the identified success factors, along with the indicators derived from them, to the working group and they contributed improvement recommendations. Based on the investigation on real processes and the validated success factors, as well as under the consideration of other existing maturity models, we developed an SME specified maturity model.

The next step would be the implementation of a tool-based assessment model, which should enable SME to evaluate their business processes cost effectively. Currently we are developing the technical and usability concepts of the tool. After this task is done, the indicators characterizing each maturity levels are positioned into the tool and a pre-test by the working group will be performed.

CONCLUSIONS AND OUTLOOK

According to the maturity model requirements proposed by Paulzen et al. (2002) and Ehms and Langen (2002), we are able to draw a conclusion that the proposed maturity model:

1. is applicable to different objects of analysis, in which it allows an evaluation of single business processes as well as of the knowledge activity sub-processes. The generality of the factors and indicators allows the model to be applied to all kinds of processes. Process specific factors can be added if desired.

2. considers the views of different participants by allowing a collective evaluation of the process by all process participants.

3. provides a systematic and structured approach which ensures transparency and reliable handling of the assessment procedure by categorizing each success factors in KPA and reasoning the level of maturity of each KPA by giving companies the opportunity to express their need for action in the particular area. For example: companies can set their need for action for the success factor *securing collective knowledge usage* to only 10% while being evaluated as having only level 1 of maturity in the particular area. A reason might be that the company only engages 3 employees and there is only very little need on collective knowledge usage.

4. provides qualitative and quantitative results by (1) summing up the fulfillment percentage of each indicators in order to arrive to a certain maturity level and (2) considering the indicators themselves as the reasons of the process' level of maturity.

5. considers the importance of continuous learning and improvement in the *optimized* level.

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