

*Tomasz Bartosz Kalinowski**

BUSINESS PROCESS MATURITY ASSESSMENT – CONCEPT, METHODS AND TOOLS

Abstract. The article is aimed at presenting the principles of Business Process Maturity Models (BPMM). They can be identified as a set of recommendations and good practices in achieving operational efficiency of performed processes. When process approach is a paradigm and according to available research organizations are becoming process – centric, the BPMM's are beginning to be seen as the sources of sustainable competitive advantage and also a tool for obtaining operational excellence. As there is a very large number of documented maturity models the article also presents the results of literature study aiming at identify the most common existing models as well as present their main features and benefits.

Key words: business process management, process maturity, business process maturity models.

1. INTRODUCTION

Increasing globalization of international and local markets and growing customer demands force organizations to look for opportunities to improve their management systems in order to enhance competitive advantage. One way to achieve this target is to focus on identification, optimization, standardization and continuous improvement of business processes. Process approach, as many studies shows (Harrington, 2006), is still one of the main areas that businesses consider as crucial for their development, as well as a way of achieving operational excellence.

In the area of process management scholars identify different dimensions that are critical for effective process improvement (Figure 1). Research show that especially important are those listed on the picture below, that is in brief: people, procedures and methods accompanied by tools and equipment.¹

* University of Lodz.

¹ SEI, Capability Maturity Model Integration for Development/Acquisition/Services, <http://www.sei.cmu.edu/reports/10tr032-034.pdf>.

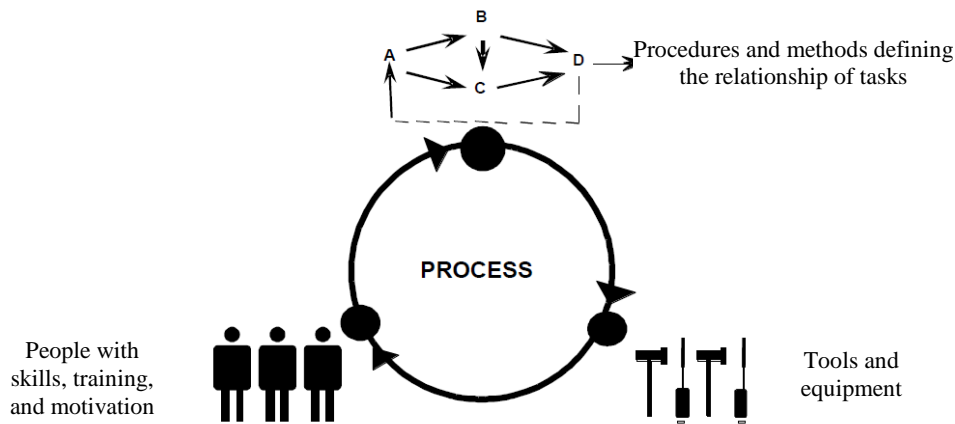


Fig. 1. Critical Dimensions of Process Improvement

Source: SEI, Capability Maturity Model Integration for Development/Acquisition/Services, <http://www.sei.cmu.edu/reports/10tr032-034.pdf>.

Those elements are linked and used by the processes that exist in every enterprise. Manufacturing organizations have recognized the importance of process effectiveness and efficiency long time ago. At present this approach is adopted by many firms from other sectors like e.g. services and the importance of quality of the processes is more often recognized.

The result of the above described trends is the growing interest of organizations in so-called Business Process Maturity Models (BPMM), which can generally be characterized as sets of recommendations and good practices that enable obtaining operational efficiency of processes. In most of the cases these models as a starting point determine the state of existing, ongoing process (called as-is state), while their aim of application is to achieve a certain, future state of the process (called to-be state), often described through maturity levels. It must be emphasized that the “maturity” with respect to processes is usually defined as the ability of the organization and its processes to systematically provide better business results (Rosemann, de Bruin, 2005; Hammer, 2007, p. 111-123).

An important place in the concept of maturity is also held by information technologies that aim at automating process execution, monitoring and control across the enterprise.

2. THE ORIGIN AND NATURE OF PROCESS MATURITY ASSESSMENT MODELS

The idea of assessing the maturity of processes derived from the concepts of Total Quality Management and Business Process Management. The first attempts to develop models for the assessment of process maturity have been taken by Crosby (Quality Management Maturity Grid) as well as Shewart and Deming (PDCA cycle and Statistical Process Control). Their works were the prerequisite for the development of one of the first comprehensive approach for assessing the maturity of processes by Watts Humphrey. In 1989, in a book entitled "Managing the Software Process," he described for the first time, rules for evaluating processes in order to establish their maturity. Those methods were in turn a starting point to develop the first maturity model – Capability Maturity Model (CMM) by the Software Engineering Institute/Carnegie Mellon University.²

The primary objective of this methodology and also the assumption that underlies the maturity assessment process is that the organizations in which managers understand the principles of the process approach and systematically manage them, are able to respond better and faster to the changing customer requirements and objectives defined at the organizational level. On the other hand, organizations that do not apply such policy (clear definition of processes and process measures, the use of procedures to ensure repeatability), are unable to accurately calculate the required time and costs to implement planned tasks (Harmon, 2008, p. 1-2).

Originally, CMM was implemented for the assessment of software development related processes. In its first version it was a list of good practices, divided into process areas (e.g. requirements management, project planning, etc.), which contributed as a base for evaluating the maturity of the whole organization. Levels of maturity in this model were evaluated on a scale from 1 (initial state) to 5 (continuous improvement of processes) when considering the various process areas.

Positive opinions about the effectiveness of described methodology very quickly exceeded the interest of managers in improving solely the processes operated by software developers. This resulted in the emergence of numerous equivalents dedicated for other areas of management, such as e.g.: SE-CMM (System Engineering), SA-CMM (Software Acquisition), IPD-CMM (Integrated Product Development) and People-CMM (Human Resources).

Multiplication of the models (both competing and complementary to each other) resulted in counterproductive effect (while the aim was the rationalization

² The rules of process maturity assessment with the usage of CMM have been published in technical report CMU/SEI-93-TR-024 ESC-TR-93-177, Capability Maturity Model for Software, Version 1.1 in 1993 and a book by Humphrey (1995).

of processes). For this reason it was decided to merge together all the models used so far, in one integrated CMM (named CMMI – Capability Maturity Model Integration). The first version of CMMI was published in 2002, second in 2006, and the edition currently valid was developed in November 2010 (it was limited to three basic models, which are synthetically presented later in this article).

3. THE CONCEPT OF CAPABILITY MATURITY MODEL INTEGRATION

In the newest version (marked as 1.3) the CMMI includes three main areas:

- 1) CMMI for Development – provides guidance for applying CMMI best practices in a development organization. Best practices in the model focus on activities for developing quality products and services to meet the needs of customers and end users.³
- 2) CMMI for Acquisition – model provides guidance for applying CMMI best practices in an acquiring organization. Best practices in the model focus on activities for initiating and managing the acquisition of products and services to meet the needs of customers and end users. It can be also treated as a reference for supplier executed activities in an acquisition initiative.⁴
- 3) CMMI for Services – provides a comprehensive set of best practices for providing services that meet or exceed customer needs. Those practices can be treated as a reference for the development of the service system, which supports delivery of the service (if this system does not exist or is not developed enough) or in cases in which the service system is large and complex, the model can be effectively used to improve such a system.⁵

Each model is built upon so-called process areas. A process area can be characterized as a group of related practices,⁶ when implemented collectively, satisfies a set of goals considered important for making improvement in that area. The examples of process areas may be: Integrated Project Management, Measurement and Analysis, Risk Management, etc.⁷

³ CMMI for Development, <http://www.sei.cmu.edu/reports/10tr033.pdf>; <http://www.sei.cmu.edu/cmmi/tools/dev/>

⁴ CMMI for Acquisition, <http://www.sei.cmu.edu/reports/10tr032.pdf>; <http://www.sei.cmu.edu/cmmi/tools/acq/>

⁵ CMMI for Services, <http://www.sei.cmu.edu/reports/10tr034.pdf>; <http://www.sei.cmu.edu/cmmi/tools/svc/>

⁶ Good practices can be defined here as recommended and necessary actions that contribute to improving the efficiency and effectiveness of organizational processes.

⁷ In order to improve the performance of the process in the last of the mentioned areas (risk management), one of the actions that should be implemented is the risk identification and analysis.

Different models are constructed in such a way that all are based on core process areas (there is 16 of them). These process areas cover basic concepts that are fundamental to process improvement in any area of interest (i.e., acquisition, development, services). The rest of the process areas are specific for particular areas of interest or specific types of businesses (development, service delivery).

The process areas are in turn decomposed into lists of goals and practices. The goals can be generic⁸ – used for all process areas, or specific⁹ – assigned to one of them.¹⁰ Practices can be defined as activities that are important from for achieving the stated goals.

Within each model there are two so-called CMMI representations¹¹ (continuous and staged) that can be used for the analysis of the processes. The continuous representation is designed to allow the user to focus on the specific processes that are considered important for the organization's short-term business objectives, or those to which the organization assigns a high degree of risk. Furthermore this representation allows to determine the profile of the organization through an independent analysis of each process area. Since the maturity level in each of the process areas may be different, the continuous representation can be used to establish a list of strengths and weaknesses of the organization and thus determine the improvement plans for each of them. The staged representation is designed to provide a standard sequence of improvements (setting process improvement strategies, objectives and timetables), can serve as a basis for benchmarking purposes between organizations (comparing the maturity of different processes, projects and organizations) and also to assess the maturity of organization as a whole.

In summary it can be concluded that continuous representation is used for assessing maturity and set improvement goals for individual processes, while staged representation focuses on assessing the maturity of the entire enterprise (with regard to the processes being performed).

⁸ A required model component that describes characteristics that must be present to institutionalize processes that implement a process area. The source of all CMMI related definitions is CMMI for Services, <http://www.sei.cmu.edu/reports/10tr034.pdf>, Appendix D: Glossary.

⁹ A required model component that describes the unique characteristics that must be present to satisfy the process area.

¹⁰ An example of a general objective relating to all process could be: "the processes have been defined and are managed," while the specific objective, referring to a certain process area (e.g. the aforementioned risk management) could be "the organization have implemented a specified risk management strategy."

¹¹ The organization, use, and presentation of a CMM's components (main architectural elements that compose a CMMI model). Some of the main elements of a CMMI model include specific practices, generic practices, specific goals, generic goals, process areas, capability levels, and maturity levels.

4. OTHER METHODS AND TOOLS USED FOR PROCESS MATURITY ASSESSMENT

Capability Maturity Model Integration is undoubtedly the most widely used model for assessing the maturity of processes, but according to available studies (Spanyi, 2004) about 150 different models of processes maturity can be identified. Most of them are based on CMMI assumptions but also premises of achieving and measuring the effectiveness of the organization formulated by Rummler and Brache.¹²

Other models that can be used for process maturity assessment, are often analyzed in research papers (Röglinger, Pöppelbuß, 2011) and should be mentioned here are Business Process Maturity Model (BPMM)¹³ and Process and Enterprise Maturity Model (PEMM – Hammer, 2007, p. 1-14).

The first of the cited models (BPMM) have been developed by Object Management Group and is intended for organizations interested or involved in improving business process related to their products and services, both for internal or external use.¹⁴ The interested parties that this methodology is dedicated for includes members of appraisal teams, members of process engineering groups, managers, and professional staff. The BPMM can be used in various manners, such as¹⁵: Guiding business process improvement programs; Evaluating the capability of suppliers; Benchmarking; and Assessing risk for developing and deploying enterprise applications.

The second stated maturity model (PEMM) and has been developed by Michael Hammer. It is described as a useful process audit toolkit that aids an organization to plan the process changes, track their progress, and eliminate encountered obstacles. The model distinguishes the maturity assessed at the level of processes and the level of an enterprise.

In order to perform an analysis of processes effectiveness and efficiency the model advises to examine five enablers of their maturity which are (Hammer, 2007, p. 3):

- Design – the comprehensiveness of the specification of how the process is to be executed (purpose, context, and documentation).

¹² According to Rummler and Brache organization is a complex system with processes inter-related with different organizational areas. A particular attention is paid to the need for correlation of those activities across the organization and eliminate the problems arising in the inter-functional relationships. According to the concept the organizational effectiveness is examined in two-dimensional system – the level of the organization (organization-wide level, the level of the process, the level of the employee) and the performance needs (targets, design principles, management principles). Rummler, G.A., Brache, A.P., *Improving Performance: How to Manage the White Space on the Organization Chart*, Jossey-Bass, San Francisco, 1990.

¹³ Business Process Maturity Model, Version 1.0, *Object Management Group*, <http://www.omg.org/spec/BPMM/1.0/PDF>

¹⁴ *Ibidem*, p. vii.

¹⁵ *Ibidem*, p. 14.

- Performers – the people who execute the process, particularly in terms of their skills, knowledge and behavior.
- Owner – a senior executive who has responsibility for the process and its results (identity, activities, and authority).
- Infrastructure – information and management systems that support the process.
- Metrics – the measures the company uses to track the process's performance (definition and use).

Apart from the enablers, Hammer also identifies four enterprise capabilities that are essential for achieving process excellence: leadership – senior executives who support the implementation and execution of processes; culture – the values of customer focus, teamwork, personal accountability and willingness to change; expertise – skills in and methodology for process redesign and governance – mechanisms for managing complex projects and change initiatives.

Apart from models that are specifically designed for process maturity assessment organizations can also use other available tools and techniques that may result in similar results. Those solutions can especially be used by less developed enterprises, where an application of the previously described methodologies could be too complex as well as time and resources demanding.

An example of such tool could be ISO 9001 standard, however it has to be emphasized that with regard to processes ISO is rather an audit standard, than a process management model. In order to distinguish the differences of the previously described approaches and ISO 9001 philosophy a brief comparison is made further. As each process maturity model is slightly different, for the purpose of this analysis the author has chosen the approach described in Capability Maturity Model Integration (CMMI). The results are shown in the Table 1.

Table 1. Comparison of Capability Maturity Model Integration and ISO 9001 requirements

Compared element	CMMI v 1.3	ISO 9001: 2008
Focus	Development, acquisition, services, detailed engineering practices.	Generic, spotlight on customer satisfaction, focus on control of records.
Scope	Ability to choose relevant process areas best suited to business needs.	Same for all companies, industries and disciplines.
Approach	Comprehensive program management practices, Concept of increasing the maturity levels of processes; ingraining processes into business needs so that such processes become part of corporate culture.	Conformance to established minimal quality requirements, ensures process discipline across entire organization, auditing as a tool for assessing the performance of processes.
Implementation	Comparing existing processes to industry best practices.	Adjusting existing processes in order to confirm to specific ISO requirements.

Source: own elaboration.

An additional analysis of literature comparisons made between CMMI and ISO standards reveals that while CMMI is more focused, complex, and aligned with business objectives, ISO is described as flexible, wider in scope and not as directly linked to business objectives. Furthermore if process maturity is taken into consideration ISO 9001 certification refers to CMMI level 2 or 3 appraisal.¹⁶ Nevertheless the attainment of either a CMMI appraisal or ISO certification help enterprises establish a management system focused on continuous improvement.

In order to assess the maturity of its processes the organizations, apart from ISO 9000 series standards, can also use one of the excellence models criteria. However all of the recognized models usually cover all managerial aspects of enterprise functioning, therefore the assessment being made is for the whole organization, not only its processes. One of the possible to use solutions is EFQM (formerly European Foundation for Quality Management) Excellence Model. It is a non-prescriptive framework for organizational management systems, often used as a diagnostic tool, that enables organizations to (EFQM 2010):

- assess the present organizational condition by identifying their key strengths and potential gaps in performance across the nine model criteria;
- provide a common understanding of organizational activities and set of notions that facilitate the effective communication of ideas, both within and outside the organization;
- integrate existing and planned initiatives, by removing duplication and identifying gaps, in order to improve organizational efficiency and effectiveness;
- provide a basic structure for the organization's management system.

As it has already been stated the described model concentrates on all enterprise's areas, as it consists of "enablers" – covering what an organization does and "results" – focusing on what an organization achieves. The five enablers are: Leadership; Strategy; People; Partnerships & Resources and Processes, Products & Services and the four result areas are: Customer Results; People Results; Society Results and Key Results. The nine criteria are shown in the Figure 2.

¹⁶ According to SEI terminology appraisal is an action similar to certification and is characterized as an examination of one or more processes by a trained team of professionals using an appraisal reference model as the basis for determining, at a minimum, strengths and weaknesses.

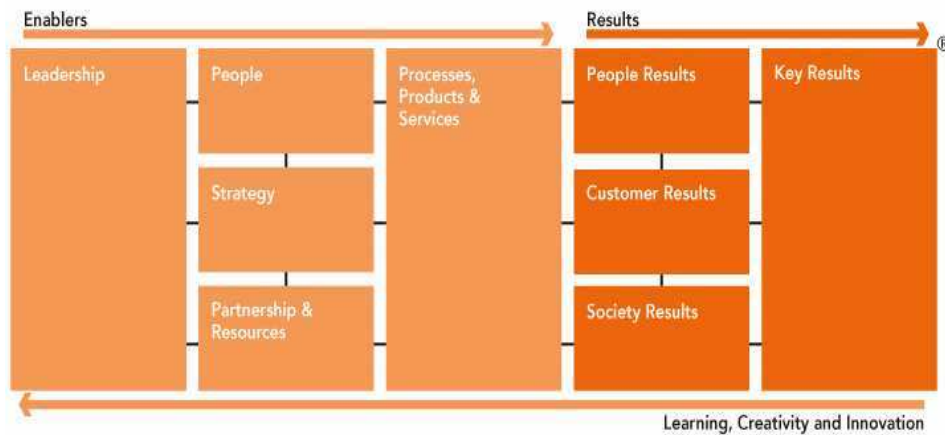


Fig. 2. EFQM Excellence Model

Source: www.efqm.org.

Although the processes are mentioned in only one criteria “Processes, Products & Services” emphasizing that excellent organizations are managed through structured and strategically aligned processes using fact-based decision making to create balanced and sustained results, the idea of process approach is present in the whole model philosophy and additionally is reflected in fundamental concepts accompanying it.

Apart from the EFQM Model, for the purpose of maturity evaluation, organizations can use other excellence models criteria (such as The Baldrige Model of Performance Excellence) or other self-assessment tools (such as ISO 9004: 2009 – *Managing for the sustained success of an organization – A quality management approach*).

5. CONDITIONS FOR PROCESS MATURITY ASSESSMENT MODELS APPLICATION

All the described process maturity models (CMMI, BPMM, PEMM) can be used regardless the sector, size or structure of the organization and should be primarily seen as tools for managers to prepare a description and analysis of the current state of the organization (as-is state) in order to determine the target of improvements (to-be state). Furthermore with using process maturity models, it is possible to identify weaknesses of the ongoing processes and focus on their elimination (process improvement). It is worth remarking that the process improvement with the use of described models can be relatively simpler, because they apply good practices and recommendations from other businesses,

determining the best ways to achieve the desired target and avoid related problems (Rosemann, de Bruin, 2005).

Most models contain maturity levels for the analyzed processes. Scales and approaches to defining them are different, but generally they can be characterized as shown in the Table 2.

Table 2. Levels of process maturity

Maturity level	Definition
0	Not much awareness of the need to improve and manage business processes exists.
1	Broad awareness of the need to improve and manage business processes exists, but little action so far.
2	Some prior success with process redesign projects, but not much sustainable process management.
3	Significant success with process redesign projects realized, and a few key end-to-end business processes managed for continuous improvement.
4	The full set of customer-touching processes is being managed for continuous improvement.
5	The entire set of enterprise business processes are being managed for improved performance.

Source: Spanyi (2004).

Process maturity models, depending on the requirements of the organization and managers, may in practice be used in different situations. As indicated earlier the basic premise is to identify the current level of maturity of processes and to recognize ways to achieve a higher one. However, the maturity models can also be used for the following purposes (Rosemann, de Bruin, 2005; Becker et al., 2009, p. 213-222):

- 1) Descriptive – a maturity model serves a descriptive purpose of use if it is applied for as-is assessments where the current capabilities of the entity under investigation are assessed with respect to given criteria; the assignment of maturity levels can then be reported to internal and external stakeholders.
- 2) Prescriptive – a maturity model serves a prescriptive purpose of use if it indicates how to identify desirable maturity levels and provides guidelines on improvement measures.
- 3) Comparative – a maturity model serves a comparative purpose of use if it allows for internal or external benchmarking. Given sufficient historical data, the maturity levels of similar business units and organizations can be compared.

Among the benefits that an organization can achieve by assessing the maturity of the processes it can be included (Gibson et al., 2006):

- process improvement and development of process management within the organization;
- integration of different methods and techniques of management in a single, coherent approach for process identification, description, evaluation and improvement;
- improved co-operation with external stakeholders (suppliers and customers), and better recognition of their needs and expectations in the performed processes;
- use of best management practices developed by teams of experts, which enables the company to deploy a personalized solutions with less effort and cost;
- easier implementation of improvements, new processes and products with the standard approach to process management in the organization.

6. CONCLUSION

Research conducted by the Business Process Management Institute (BPMI) in 2006¹⁷ and BPTrends in 2010¹⁸ show that companies are increasingly becoming process oriented and perceive process management as a key factor of their market success. Other trends in the process management area identified by BPMI show that many companies created institutional foundations for the construction of process organizations, while those that have not yet implemented the principles of process management are in the phase of recognition, learning the concept or planning changes in their processes. Cited studies also point that, the main techniques of process management used in enterprises, relate primarily to the analysis and design of business processes (e.g. the supply chain design, the value chain identification, new products design) and business process management (e.g. optimization and reengineering of existing processes, identifying measures of process effectiveness and efficiency). BPMI research also indicate that the methods of process management are most commonly used for assessment and improvement of purchasing, manufacturing, sales, deliveries to the customer and customer service processes – therefore most crucial areas in the activities of any organization.

In author's opinion solely the implementation of the process approach is not sufficient to achieve improved efficiency of the organization – the managers must also ensure an adequate level of the processes being performed (maturity).

¹⁷ BPMInstitute.org, State of Business Process Management (BPM) (SM): Assessing the Current State of BPM Awareness and Usage, BPMInstitute.org, 2006.

¹⁸ The research was carried out in a group of 300 managers (mainly from the North America and Europe), who were responsible for the process management in the analyzed organizations; *The State of Business Process Management*, 2010.

Additionally, the inconsistencies in processes functioning results in identification of potential problems that may arise at different stages of their implementation and require preparation of solutions and application of continuous improvement tools. A concern for the organizational processes can be expressed by implementation of the process maturity models described in this article, that can be used for the analysis, followed by the design, modifications and continuous improvement of organizational processes in order to achieve their greater efficiency and effectiveness.

REFERENCES

- Becker J., Knackstedt R., Pöppelbuß J. (2009), "Developing Maturity Models for IT Management – A Procedure Model and its Application", *Business and Information Systems Engineering*, Vol. 1, No. 3.
- Bruin de T., Rosemann M. (2007), "Using the Delphi Technique to Identify BPM Capability Areas", *18th Australasian Conference on Information Systems*, 5-7 December, Toowoomba, p. 642–653.
- Capability Maturity Model for Software, Technical Report CMU/SEI-93-TR-024 ESC-TR-93-177, Version 1.1.
- EFQM Excellence Model (2010), Brussels: EFQM.
- Gibson D. L., Dennis R. Goldenson K. (2006), *Performance Results of CMMI®-Based Process Improvement, Technical Report*, Carnegie Mellon University, www.sei.cmu.edu/reports/06tr004.pdf.
- Hammer M. (2007), "The Process Audit", *Harvard Business Review*, No. 4.
- Harmon P. (2008), "Governance and Maturity", *Business Process Trends*, Vol. 1, No. 7.
- Harrington H. J. (2006), *Process Management Excellence. The Art of Excelling in Process Management*, California: Paton Press.
- ISO 9001: 2008, *Quality management systems – Requirements*.
- OMG: Business Process Maturity Model (BPMM) – Version 1.0 (June 2008), <http://www.omg.org/spec/BPMM/1.0/>.
- Rosemann M., de Bruin T. (2005), "Application of a Holistic Model for Determining BPM Maturity", *BPTrends*, February, <http://bpm-training.com/wp-content/uploads/2010/04/applicationholistic.pdf>.
- Röglinger M., Pöppelbuß J. (2011), *What makes a useful maturity model? A framework for general design principles for maturity models and its demonstration in business process management*, *19th European Conference on Information Systems*, Helsinki, Finland, June.
- Rummler G. A., Brache A. P. (1990), *Improving Performance: How to Manage the White Space on the Organization Chart*, San Francisco: Jossey-Bass.
- SEI, Capability Maturity Model Integration for Acquisition, <http://www.sei.cmu.edu/reports/10tr032.pdf>.
- SEI, Capability Maturity Model Integration for Development, <http://www.sei.cmu.edu/reports/10tr033.pdf>.
- SEI, Capability Maturity Model Integration for Services, <http://www.sei.cmu.edu/reports/10tr034.pdf>.
- Spanyi A. (2004), "Beyond Process Maturity to Process Competence", *BPTrends*, June.