

Andrej Miklosik¹, Kamila Janovska²

MEASURING MATURITY OF PROJECT MANAGEMENT IMPLEMENTATION PROCESSES

In this article, the authors introduce the Capability Maturity Model for Project Management (CMM-PM) as a methodology, which creates a framework for continual process improvement in the project management area. The results of the primary research have shown that companies in the ICT sector in Slovak Republic do not apply the CMM methodology to these processes. Despite this fact, 60% of these companies could be categorized to the CMM Level 2, since they have satisfied the requirements, both general practices and key process areas, to describe their processes as managed. Research results and implications regarding the measurement of maturity and performance of processes and their optimization are listed in the article as well.

Keywords: capability maturity model; process implementation; process maturity; project management.

JEL classification: M12, M16.

Андрей Міклошій, Каміла Яновська

ВИМІРЮВАННЯ ЗРІЛОСТІ ПРОЦЕСІВ УПРАВЛІННЯ ПРОЕКТОМ

У статті представлено модель технологічної зрілості проектного управління як методологію постійного вдосконалення процесів у галузі управління проектами. Результати дослідження показали, що словацькі компанії сектору ІТ не використовують дану методологію в управлінні. Незважаючи на це, 60% досліджених фірм можна віднести до другого рівня даної моделі, оскільки вони все одно дотримуються загальних вимог управління процесами. За результатами дослідження розроблено рекомендації щодо вимірювання зрілості проектного управління та оптимізації менеджменту.

Ключові слова: модель технологічної зрілості; процесне управління; зрілість процесів; проектний менеджмент.

Рис. 3. Табл. 2. Літ. 10.

Андрей Миклошик, Камила Яновска

ИЗМЕРЕНИЕ ЗРЕЛОСТИ ПРОЦЕССОВ УПРАВЛЕНИЯ ПРОЕКТОМ

В статье представлена модель технологической зрелости проектного управления как методология постоянного усовершенствования процессов в сфере управления проектами. Результаты исследования показали, что словацкие компании сектора ИТ не используют данную методологию в управлении. Несмотря на это, 60% исследуемых фирм можно отнести ко второму уровню данной модели, поскольку они всё равно выполняют общие требования управления процессами. По результатам исследования разработаны рекомендации по измерению зрелости проектного управления и оптимизации менеджмента.

Ключевые слова: модель технологической зрелости; процессное управление; зрелость процессов; проектный менеджмент.

Introduction. Over the past few decades, organisations from different sectors have been switching their management processes towards systematic implementation of project management. More and more of their internal and external operations and

¹ University of Economics in Bratislava, Slovakia.

² VSB – Technical University of Ostrava, Czech Republic.

tasks are categorized as projects and coordinated by a project manager with a project team. This approach can be assessed as positive, however, the question is how precisely and systematically can a company focus on these new processes. It requires a lot of skills, time and support from top management to implement the project management methodology and processes into everyday company operations, and even more, into more demanding projects. The success of a project is determined by multiple factors. According to A. Miklosik (2014), numerous critical factors exist that cause failure of majority of projects: Vaguely defined project justification (business case), changing expectations and conditions, low involvement of business management, lack of fusion project organization with corporate culture or underestimation of complexity and difficulty of a project. In this situation, it is advised that a company not only implements project management methodology, but it also measures the progress of this implementation. This approach leads to continual improvement and finally, positively influences the quality of project and company outputs, affects motivation and loyalty of employees and reasonably contributes to knowledge-generating culture creation.

Research objective. In this article the authors aim at showing the possibilities of applying the generally accepted model for measuring capability of processes (CMM – Capability Maturity Model) to the area of project management implementation. With this approach, the company will be able to define its targets, measure the performance in each areas (called KPAs) and continually improve processes to the desired level. Moreover, in the presented research results the authors map the situation in the companies of the ICT sector in Slovak Republic regarding the maturity of project management processes implementation.

Project management capability maturity – theoretical fundamentals. Theoretical fundamentals for this research can be found in CMM models in variations. The basic Capability Maturity Model (CMM) was originally constructed to improve the software development processes. This model is based on the process maturity framework, published by (Humphrey, 1989). As A. Miklosik (2014) notes, although the model has been designed for software development, it can be also applied to business processes generally and has been used extensively worldwide by different institutions, both governmental and commercial. Based on CMM, the CMMI (Capability Maturity Model Integration) model was created to remove the problem of using multiple models for software development processes, which included (IT Governance Institute, 2007):

- The Capability Maturity Model for Software (SW-CMM) V2.0 draft C (SEI 1997b).
- The Systems Engineering Capability Model (SECM) (EIA 1998).
- The Integrated Product Development Capability Maturity Model (IPD-CMM) V0.98 (SEI 1997a).

However, the original CMM is still generally accepted as a theoretical basis for further applications (designated as CMM-SW to distinguish it from different CMM models). When constructing a maturity model for project management implementation, we took the CMMI as the latest and up-to date framework as a theoretical fundament. This approach is driven by dr. Zemel as well, who is one of 200 High Maturity Lead Appraisers worldwide to be certified by the Software Engineering

Institute (SEI) of Carnegie Mellon University to lead formal appraisals of companies using the CMMI models as reference. She took CMMI as the basis for her research in measuring project management maturity as well (Zemel, 2004). The model, as an input to our future research, is created by 5 basic maturity levels (Figure 1).

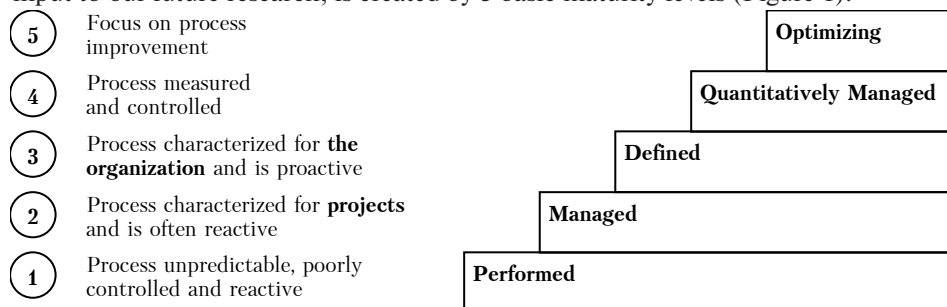


Figure 1. **Capability Maturity Levels**, constructed by the authors according to (Zemel, 2004)

From the level 1, the organization moves forward by implementing various processes/requirements, designated as general practices (GPs) and key process areas (KPAs), which are more specific to the respective managerial area, which is project management in this case. According to A.T. Berztiss, the definition of KPA starts with the statement of its goals, the commitment to perform, which is essentially a policy statement committing the organization to the satisfaction of these goals, and the ability to perform statement, which lists the resources that have to be allocated (Schwartz and Dov, 2011). Next comes a list of activities that need to be performed in order to achieve the goals of KPA. In addition, there is an indication of what process measurements are to be made and to what review procedures the activities of a KPA are to be subjected (Schwartz, 2006). In Table 1 we show 5 basic stages of the CMM model.

Table 1. **CMM five levels (Miklosik, 2014)**

Level	Designation	Characteristics
Level 1	Initial	Processes are usually undocumented and in a state of dynamic change, tending to be driven in ad hoc, uncontrolled and reactive manner by users or events. A chaotic or unstable environment for processes.
Level 2	Repeatable	Processes at this level are repeatable, possibly with consistent results. Process discipline is unlikely to be rigorous, but where it exists it may help ensure that existing processes are maintained at stress.
Level 3	Defined	Defined and documented standard processes that are subject to some degree of improvement over time. These standard processes are in place and used to establish consistency of process performance across the organization.
Level 4	Managed	Processes are to be effectively controlled by management. Management can identify the ways to adjust and adapt processes to particular projects without measurable losses of quality or deviations from specifications.
Level 5	Optimizing	Focus is on continual improvement of performance using both incremental and innovative technological changes or improvements.

In the original CMM-SW model, 12 key process areas have been defined. They included: KPA01 – knowledge requirements management; KPA02 – internal knowledge acquisition; KPA03 – uncertainty awareness for Level 2; KPA05 – knowledge representation; KPA06 – knowledge engineering techniques; KPA07 – user access

and profiling for Level 3; KPA08 – integrated KMKE process; KPA09 – external knowledge acquisition; KPA10 – qualitative cost-benefit analysis for Level 4; KPA11 – technology change management; KPA12 – quantitative cost-benefit analysis for Level 5.

Furthermore, the work of Crawford has served as inspiration for creating the proposed CMM-PM methodology for application of CMM to project management processes. Figure 2 presents the Project Management Maturity Model, containing the matrix of 5 Maturity Levels and 10 Knowledge Areas.

	Level 1 Initial Process	Level 2 Structured Process and Standards	Level 3 Organizational Standards and Institutionalized Process	Level 4 Managed Process	Level 5 Optimizing Process
Project Integration Management					
Project Scope Management					
Project Time Management					
Project Cost Management					
Project Quality Management					
Project Human Resource Management					
Project Communications Management					
Project Risk Management					
Project Procurement Management					
Stakeholder Management					

Figure 2. **Project Management Maturity Model**, constructed by the authors according to (PM Solutions, 2013)

Several methodologies exist to measure the maturity of project management. Usually they are referred to as PMMMs (Project Management Maturity Models). As can be seen in Figure 2, Crawford's model consists of 10 measurement areas. K.P. Grant and J.S. Pennypacker (2006) use 42 detailed components in their project management maturity model. After studying the available PMMS we have decided to construct the model, which reflects both the PMBOK and PRINCE2 principles, along with the need for differentiation between general practices, which are closely connected to the project management area, but are of more general character; and key process areas, which represent the key performance areas of project management. We use the designation CMM-PM for this methodology for application of CMM to project management. To reach any of the level 2 to 5 maturity levels, the organisation has to define both generic and specific goals and implement both generic and specific practices. The model is depicted in the Table 2, along with the focus of each level, its general practices and key process areas.

Table 2. Key process areas of CMM-PM, authors' development with the use of information from (Zemel, 2004; Crawford, 2006; PM Solutions, 2013)

Level	Focus	Generic Practices (GPs)	Key Process Areas (KPA's)
Level 2	Fundamental Project Management	GP01. Establish an Organizational Policy GP02. Plan Processes GP03. Provide Resources GP04. Assign Responsibilities GP05. Manage People GP06. Train People GP07. Manage Configurations GP08. Identify and Involve Relevant Stakeholders GP09. Monitor and Control Processes GP10. Objectively Evaluate Adherence GP11. Review Status with Higher Level Management	KPA01. Requirements and Scope Management KPA02. Project Planning KPA03. Project Monitoring and Control KPA04. Project Time Management KPA05. Procurement Management KPA06. Measurement and Analysis KPA07. Process and Product Quality Assurance KPA08. Configuration Management KPA09. Cost Management
Level 3	Process Standardization	GP12. Establish a defined process GP13. Collect improvement information	KPA10. Requirements Development KPA11. Technical Solution KPA12. Project and Product Integration KPA13. Verification KPA14. Validation KPA15. Organizational Process Focus KPA16. Organizational Process Definition KPA17. Organizational Training KPA18. Integrated Project Management KPA19. Integrated Supplier Management KPA20. Risk Management KPA21. Decision Analysis and Resolution KPA22. Organizational Environment for Integration KPA23. Integrated Teaming
Level 4	Quantitative Management	GP14. Establish process improvement metrics GP15. Integrate statistical evaluation methods	KPA24. Organizational Process Performance KPA25. Quantitative Project Management
Level 5	Continuous Process Improvement		KPA26. Organizational Innovation and Deployment KPA27. Causal Analysis and Resolution

Project management capability maturity – research results. For companies it is necessary to prepare and set up the project management implementation programme (PMIP) systematically. This includes tasks, deadlines and monitoring of progress. In our research we aimed at identifying the progress of PMIP using the capability maturity model for project management (CMM-PM), which was constructed before performing this empirical study. We have realized this primary research in the form of indepth interviews with key managers (usually from top management) of 25 ICT

companies in Slovak Republic. All sizes of companies have been included in the research as following: microentities (0–10 employees) – 8%; small companies (11–50 workers) – 60%; medium-sized enterprises (51–250 employees) – 24%; large companies (251+ employees) – 8%. The research was realized in January-February 2014 and the results were analysed and processed consequently. We asked top managers a set of questions that helped to identify the state of PMIP in their company. Research on the PMIP situation was part of a bigger research project, including measuring maturity of other key managerial processes as well, for example, knowledge management implementation processes (KMIP).

We applied the following methodology by the research: Firstly, we asked the managers to state their attitude to main project management topics and their interpretation regarding the business of their company. Secondly, they were required to characterize the situation related to project management implementation in their companies. Finally, we discussed 15 general practices and 27 key process areas from our CMM-PM model with each manager to determine, if this process is defined and applied in the company and at which level. Following this, we analysed the results, filtered the answers and proposed the following results regarding the system and the level of project management system implementation in ICT companies in Slovakia. The main findings identified after processing the results include the following:

- All companies (100%) deliver products to their customers via projects.
- Majority of companies (88%) use projects also for internal operations to deliver outputs and products in internal processes.
- Each company (100%) has experience with failed projects or projects which ran out of time and/or budget.
- All managers (100%) are aware of the importance of systematic project management.
- In most cases (72%) companies have an internal structure with the position of project manager or a project management office (PMO). Despite these facts we have found out that no single company is using the CMM-SW or CMMI methodology to improve its project management processes.

Despite this, we were able to determine that some of these companies had control in place that enabled them to comply with some of GPs and KPAs. However, because of the lack of system in their approach, no single company was able to reach the level 3 or higher. Some of them have fulfilled some requirements from the level 3 including several GPs and/or KPs, but still missing compatibility with one or more GPs and/or KPAs has caused their inability to reach the level 3. We visualize the final categorization based on our research in Figure 3.

Our findings partially correspond with the research of (Grant and Pennypacker, 2006), who have identified that the median level of project management maturity is level 2 out of 5. In their research, companies from 4 sectors were included and one of them was ICT. As they claim, no significant difference in project management maturity exists between various industries. Thus, we could assume that at least several of our research findings can be applicable to other industries as well, including professional, scientific and technical services; information; finance and insurance and manufacturing.

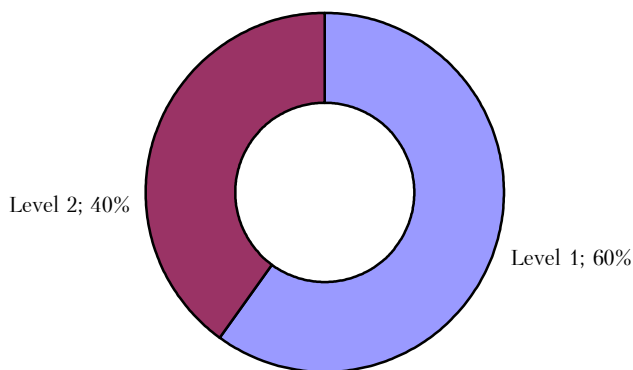


Figure 3. **CMM-PM level of companies in the ICT sector in Slovakia,**
composed by the authors

Conclusion. Based on our research we are able to confirm that the organisations are aware of the necessity of improving their project management processes. However, they did not have enough knowledge, time, commitment and support to systematically define, analyse, monitor the processes and implement tools to improve the current state significantly. We can only agree to M.E. Nenni, who points out at the importance of a closer connection between PMMs and financial performance (Nenni et al., 2014). The proposed CMM-PM methodology, if followed thoroughly, will definitely assist managers in ensuring the continual improvement of project management processes and will serve as a catalyst for future growth of the whole organisation.

References:

- Crawford, J.K.* (2006). Project Management Maturity Model, Second Edition (PM Solutions Research). Boca Ration: Auerbach Publications. 2nd edition.
- Grant, K.P., Pennypacker, J.S.* (2006). Project management maturity: An assessment of project management capabilities among and between selected industries. *IEEE Transactions on Engineering Management*, 53(1): 59–68.
- Humphrey, W.S.* (1989). Managing the software process. Addison-Wesley.
- IT Governance Institute (2007). COBIT Mapping: Mapping of CMMI for Development v1.2 with COBIT 4.0. Rolling Meadows: ITGI // www.isaca.org.
- Miklosik, A.* (2014). Measuring capability maturity of knowledge management implementation. In: *Economics and Business Management in the 21st Century* (pp. 110–117). Ostrava: VSB – Technical University of Ostrava.
- Nenni, M.E. et al.* (2014). How to increase the value of the project management maturity model as a business-oriented framework. *International Journal of Engineering Business Management*, 6(1).
- PM Solutions (2013). What is the Project Management Maturity Model (PMMM)? // www.pmsolutions.com.
- Schwartz, D., Dov, T.* (eds) (2011). Encyclopedia of Knowledge Management. Second Edition. Hershey, PA, USA: IGI Global.
- Schwartz, D.G.* (2006). Encyclopedia of Knowledge Management. Hershey: Idea Group Inc (IGI).
- Zemel, T.* (2004). Project Management According to the CMMI // www.pmi.org.il.

Стаття надійшла до редакції 8.10.2014.