

Joanna Świętoniowska

Chair of International Economic Relations and European Studies; Project Office
University of Information Technology and Management in Rzeszow

TOWARD PROJECT MANAGEMENT MATURITY. KNOWLEDGE TRANSFER AS KEY BEHAVIOUR OF MATURE ORGANIZATION

Introduction

The environment in which organizations operate nowadays changes rapidly and becomes more and more complex. The usage of project management tools and techniques becomes critical to increase competitiveness and efficiency of activities. Repetitive, standardized processes are replaced by unique and complex projects which help organizations to achieve competitiveness and growth. As Andersen & Jessens (2003) notice, project management currently pays its attention not to a single project but extends its focus on the way in which an organization deals with projects and uses them to achieve its strategic objectives.

Maturity models have become an important tool in assessing organization's abilities to deal with its projects. The models describe different levels on the maturity evolution path and allow organizations to compare their competence and processes in the area of project management. These models consist of the hierarchical collection of elements describing the characteristics of effective processes, and their use can enable organizations to reap the benefits brought by improved capability at all levels (OGC, 2006).

Many project maturity models emerged last years and have been described in project management literature (Hillson 2001; Kerzner 2001; Crawford 2006; Ibbs et al. 2003; Juchniewicz 2009). Some studies have discussed the correlation between the level of project management maturity and project performance (Ibbs & Kwak 1997; Jiang et al. 2004; Ibbs & Kwak 2000).

A lot of organizations desire to achieve excellence in project management by implementing standards for project management. Many of these standards have appeared from the observation of different practices of an organization which have led to project success or failure.

The best known standards are developed by Project Management Institute (PMI 2004), International Project Management Association (IPMA 2009) and Office of Government Commerce (2005).

However, reaching excellence in project management requires not only an implemented project management methodology but also a developed culture that facilitates distribution and re-usage of project knowledge. Most of organizations pay attention to tools and techniques implemented to improve the process of project management but take no notice of knowledge management strategy and a systematic way of capturing project knowledge. Project knowledge, especially experience-based one is a critical resource of project-oriented organizations and a fundamental factor approximating an organization to project management excellence. The steps towards project management maturity require a commitment to a continuous learning process.

The paper is organized as follows. First, the concept of project maturity is raised. Then, knowledge management in general and in project context is discussed. Afterwards, I present how maturity of project management and project knowledge management are linked and describe different levels of project management maturity in regards to transfer and re-usage of knowledge. Finally, the findings regarding the methods of capturing, sharing and using project knowledge as well as experience are submitted and analyzed. The last section gives concluding information.

1. The matter of maturity

As interest of project management maturity models has increased, the number of different definitions of this concept have been developed in literature. The Oxford Dictionary of English Dictionary (ODE 2010) defines the word mature as fully developed and having reached the most advanced stage in a process. Maturity is the quality or state of being mature. If we apply this definition to project management, it may mean that project maturity is the state in which an organization is perfectly conditioned to deal with its projects (Andersen & Jessen 2003). Project management maturity can also be described as organization's receptivity to project management (Skulmoski 2001). Some researchers underline the role of repeatability in project management. Then maturity can be viewed as the development of systems and processes that are repetitive by nature and provide a high probability that each project will be a success (Kerzner 2004). Many of the definitions pay attention to the level of abilities and techniques used in current project management practices and processes (Ibbs et al. 2003; Juchniewicz 2009) as well as on the extent to which an organization practices project management (OGC 2006). An interesting definition, from the point of view of this paper, is the concept of project maturity proposed

by Anderse & Jessen (2003). According to them, maturity is best explained as the sum of action, attitude, and knowledge. The process of achieving more sophisticated levels of maturity in project management requires the implementation of structured approach – maturity models.

Maturity models have their roots in the Total Quality Management (TQM) which focuses on continuous improvement of processes and procedures within the organization to achieve higher efficiency, effectiveness and better performance. All maturity models provide a framework in the field of project management improvements and they are a point of reference for an organization to understand its current position of the overall organizational competency and to realize the aims for the future. All models illustrate the combination of steps to help an organization to improve processes and practices in the field of project management. Kania (2001) described maturity models as a repository of knowledge about what required criteria should be used for assessment and what should be done to improve processes. Maturity models can also serve as a point of reference for organization in context of project management practices.

Modern maturity models are based on capability maturity model developed by Software Engineering Institute (Paulk et al. 1993) as the feedback of experiences of the software practitioners. The main purpose of it, was to improve the quality of the software development processes to achieve outcomes through continuous improvements. The CMM is built as a five-level model where each level represents different stages of maturity from a process performed ad hoc to a mature process with high level of specialization.

Since the earliest maturity model was developed by SEI many different maturity models have been introduced to improve PM effectiveness. The current number of different project management maturity models is estimated at 30 (Pennypacker & Grant 2003). While presenting existing maturity models, the greatest attention should be paid to five maturity models. The first one is Berkeley PM Process Maturity Model – (PM)2 developed at the University of California in the late 90's (Ibbs & Kwak 1997; Ibbs & Kwak 2000; Ibbs & Kwak 2002). The model is the foundation to evaluate an organization's current PM maturity level. Each level consists of project management characteristics, factors, and processes. (PM)2 model demonstrates series of steps that help an organization to improve its effectiveness in the field of project management (Ibbs & Kwak 2002). Another PM maturity model describes maturity by utilizing the PMBOK Guide's nine PM knowledge areas and five levels of maturity in CMM model (Crawford 2006). Each organization defines its PM maturity level by examining its competency across the nine PM knowledge areas. As projects are implemented in different project environments: multiprojects, portfolios, roll-out projects etc. (Pankowska 2010) Project Management Institute has developed Organizational Project Management Maturity Model (PMI 2003) which divides project management into three elements:

project management, program management, and portfolio management. Kerzner's Project Management Maturity Model (PMMM) has been created as a result of the survey of project management practices in hundreds of organizations. In his concept maturity levels overlap each other and before moving up to the next level, the lower one must be completed. Another model, Prince 2 Maturity Model (P2MM) consists of a five-level maturity framework, seven process perspectives covering essential aspects of PM and attributes for each level of maturity within each of the process perspectives (OGC 2010).

As remarked by Jugdev and Thomas (2002), the different modifications of CMMs and other general maturity models involve five linear stages. The names of the stages differ between approaches and they are presented in table below.

Table 1

Levels in different project management maturity models

	CMM	(PM)²	Kerzner's PMMM	P2MM
Level 1	Initial Level	Ad hoc Stage	Common Language	Awareness of Process
Level 2	Repeatable Level	Planned Stage	Common Processes	Repeatable Process
Level 3	Defined Level	Managed Stage	Singular Methodology	Defined Process
Level 4	Managed Level	Integrated Stage	Benchmarking	Managed Process
Level 5	Optimizing Level	Sustained Stage	Continuous Improvement	Optimized Process

Source: Developed for this study.

2. Essence of project knowledge

Stanislaw Gasik (2011), referring to Sankarasubramanian (2009), states that all projects have one thing in common—knowledge. Knowledge is defined by Liebeskind (1996) as the information whose validity has been established through tests of proof. It can include knowledge which is personal, know-how, skills acquired through experience as well as written documents.

As project management has become common, the need for knowledge management in projects has been widely discussed (Bellini & Canonico 2008; Boh 2007; Crawford & Pollack 2007; Disterer 2002; Levin & Rad 2007; Schindler

& Eppler 2003; Ruuska & Vartiainen 2005). Knowledge management in projects seems to be different than knowledge management in general due to their special nature. Projects are unique undertakings characterized mainly by limited time and resources, high risk, great complexity and temporary teams which require more efficiency. Gasik (2011) participates in the discussion on the definitions of knowledge management in literature. Referring to the definition of Probst, Raub & Romhard (2003), knowledge management describes a process during which knowledge is systematically and actively identified, activated, replicated, stored, and transferred. Gasik states that general definitions of knowledge management are valid and important for the management of project knowledge (Gasik 2011). Reich, Gemino and Sauer (2012) define knowledge management in the field of project as “the management activities required to source the knowledge stock, create the enabling environment, and manage the knowledge practices to result in an aligned set of project-based knowledge”. Knowledge stock is the knowledge of individuals, a project team and an organization available to the project.

There are a lot of studies that deal with various aspects of project knowledge management. The important issue discussed in this field is a knowledge transfer across projects and its re-usage (Cooper et al. 2002; DeFillippi & Arthur 1998). Schindler & Eppler (2003) notice that the need to retain and re-use knowledge from projects is very important for organizations due to the knowledge loss when projects end. The main problem in temporary organizations such as projects is that project knowledge often disappears when people involved in project implementation go to other tasks or projects. The knowledge and experience are dispersed when the project is completed. It especially affects immature organizations without implemented project knowledge management standards.

Project knowledge can be consider in two dimensions (Gasik 2011): as micro-knowledge which is defined as knowledge required to perform a task or its part, and as macro-knowledge which is the total knowledge of:

- a given person in case of individual macro-knowledge or
- a given team in case of project team macro-knowledge or
- an organization in case of organizational macro-knowledge or
- a global community of project managers in case of global macro-knowledge.

Acquired knowledge should be transferred vertically between different levels e.g. from individual level to project team, organizational and global level. Knowledge needed at project level can be possessed from other levels as well (Gasik 2011).

Knowledge in the project context may occur as either tacit or explicit knowledge. Tacit knowledge is defined as knowledge which is not easily articulated. Nonaka (2000) characterizes it as knowledge which is “subjective and experimental and hard to formalized” and Polanyi (1966) summes up with the phrase “We know more than we can tell”. Tacit knowledge is learned via

practical experience, and it remains in the heads of the project team members. The examples of this sort of knowledge are belief, mental models, perspectives. Conversely, explicit knowledge is knowledge that can be easily articulated and disseminated to others. Explicit knowledge is described in formal language and can be transferred through documents. Explicit knowledge means 'know-what' while tacit knowledge means 'know-how' and 'know-why'.

Although explicit knowledge is important in project management which requires standardization, procedures and documentation, knowledge that matters most in the project context is tacit knowledge. Therefore in this paper more emphasis is placed on tacit knowledge.

Tools facilitating knowledge transfer

The storage, transferring and re-using of project knowledge can be supported by the appropriate system of procedures. The existing elements of this system can be such tools as lessons-learned database, project reviews or inter-project meetings.

Table 2

Exemplary tools for project experience accumulation and knowledge management

LEVEL	EXPERIENCE & KNOWLEDGE
Member of the project team	Diary Job rotation On the job training Specialization Re-use of experts Reporting systems
Project Team/project	Person-to-person communication Informal encounters Formal project reviews Ad hoc meetings Lessons learned database Project history database Project plan reviews
Organization	Project management processes Lessons learned database Organizational routines, rules Inter-project meetings

Source: Own elaboration based on Prencipe & Tell 2001.

3. Project knowledge & project management maturity

Although there have been many studies written to prove the importance and applicability of maturity models in project management, little attention has been paid to how effective project knowledge transfer can affect the ability to reach higher level of maturity in PM.

Looking for the links between project knowledge and project management maturity, attention should be paid to the definition of project management. Project management is the application of knowledge, skills, tools and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project (PMI 2008). It underlines that one of the requirements to achieve project success (measured e.g. by stakeholders' satisfaction) is the implementation of knowledge and skills which are the inseparable elements of project management. Thus, the application of knowledge is a prerequisite for building maturity in project management by an organization.

Kasvi, Vartiainen & Hailikari (2003) state that "successful project management should be based both on accumulated knowledge and individual, collective competences". Taking into consideration some definitions of maturity in project management which explain maturity as the state in which an organization is perfectly conditioned to deal with its projects (Andersen & Jessen 2003) as well as the organization's receptivity to project management (Skulmoski 2001) we can sum up that the advancement in PM maturity level is described by how successful project management in organization is. Thus, the foundation for building maturity in the project management context is the knowledge of individuals, teams and the organization involved in project implementation as well as knowledge transferred and acquired from other projects, where the latter is the most valuable one. According to Williams (2003) "learning from project is prerequisite for project oriented organizations". Many trainings and guidelines have been offered on the market to rise knowledge of people involved in project management since the discipline of PM was developed. There is no difficulty in acquiring some basic knowledge how to manage project in a proper way. However, tacit knowledge especially that possessed from experience in other projects is a competitive advantage of each project team and organization and can lead to high organizational maturity in PM. Well-working project management supported by the system which allows for storing, transferring and re-using project knowledge is essential for establishing an organization pretending to achieve excellence in project management.

As Gasik (2011) suggests, the acquired knowledge should be transferred in different directions between the levels: individual level, project team level, organizational and global level. Knowledge should be acquired not only from the experience from the previous projects but also from project environment which is complex and gives great opportunities to learn from.

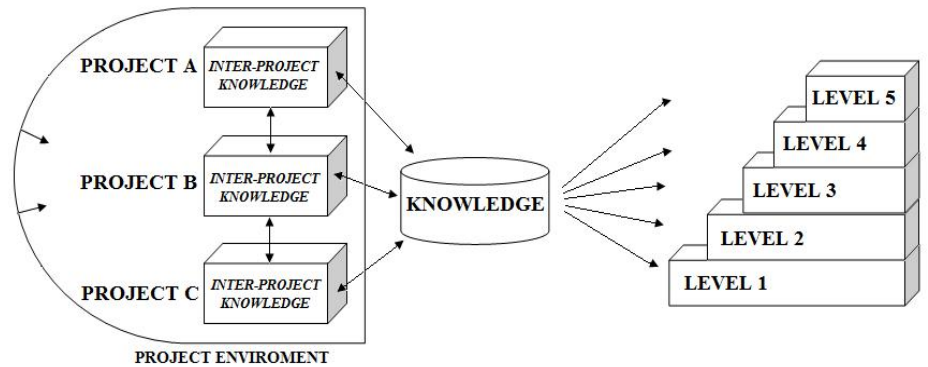


Figure 1. Impact of project knowledge flows on project management maturity level

Source: Developed for this study.

A number of project management maturity models are based on nine knowledge areas described in The Project Management Body of Knowledge (PMI 2008). The nine knowledge areas are: 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, and Project Procurement Management. As Spalek (2012) has noticed, knowledge management in maturity models is applied only as a part of other knowledge areas. He has underlined the need for building a new model in which knowledge management could be a separate area. As project management maturity of an organization is assessed mainly against nine knowledge areas, the additional area in the context of knowledge management would be the equivalent metric for assessment.

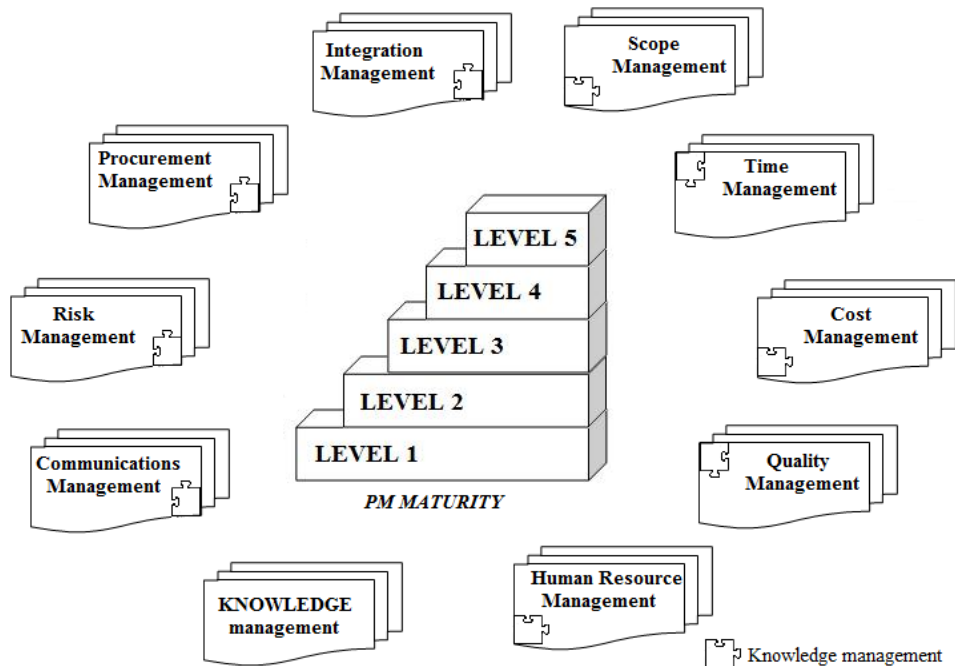


Figure 2. PM Maturity Model including Knowledge Management as a separate area

Source: Own elaboration adapted from Spalek 2012.

4. Project knowledge at maturity levels

Regarding different levels of project management maturity, the quality of created knowledge may vary as well as the extent of usage and the ability of the organization to utilize it. Below there are the descriptions of 5 levels of project management maturity in regards to transfer and re-usage of knowledge.

Level 1 is ad-hoc/initial stage, there are no project plans and procedures. Project management processes are not predictable and they are not controlled. At level 1 no knowledge management system is available and project management data and experiences are not collected. There are no formal guidelines to ensure that project management practices are continuous (Ibbs et al. 2003). Usually organizations at this level do not operate as a project-base and projects are implemented incidentally. As a result, success in project management depends on knowledge, experiences and competencies of individuals rather than organization's knowledge.

In the organization there is no wide knowledge about project management practices and processes, thus knowledge transfer and re-usage from individuals are highly important for a low mature organization to attain higher level of maturity. It is especially important in the situation where people involved in project implementation return to their line functions or leave their workplace after the project ends and take their experience with them. The finishing of the first level requires gaining fundamental knowledge on the principles of project management as well as learning from previous experiences.

At Level 2 as project management is accepted, informal procedures are used to manage project processes. Nevertheless, the process of project management still depends on a few key individuals with experience of PM who ensure the organization to repeat success continuously. As the organization introduces number of initiatives, people learn and practice by taking part in the project team which is the place where knowledge is created, learned and utilized. Informal data in the context of project management is collected. Completion of this stage requires moving from acquiring basic knowledge to standardizing PM processes. Successful applying PM principles involves the knowledge of individuals, the project team and organization as well as re-using knowledge from the previous projects.

Level 3 processes of project management are well understood and described in guidelines, procedures, standards and tools. Procedures and standards are more detailed than at level 2. The organization realizes that singular methodology could be more effective than multiple methodologies. At this level, the project standards, processes and procedures are adjusted from the organization's set of standard processes to suit a particular project. Experiences and challenges regarding project management are informally documented. The culture becomes a cooperative culture (Kerzner 2001). Project data is shared between teams members to help project management. Skills and practices are informally trained.

At level 4 project management processes are formally established, measured and documented. Data related to project management is standardized, collected and stored in a database to be re-used in current and future initiatives. The organization demonstrates the strong sense of teamwork. There is a framework to facilitate and optimize learning within or between projects. As the organization starts to manage projects at corporate level, the prototype of Project Management Office (PMO) can appear as a unit for learning and sharing knowledge in the project management. The responsibility of this unit is to centralize information so that a knowledge base is created as well as managing best practices of project management, learning from projects, and improving the maturity of project management at the organization (Desouza & Evaristo 2006).

Achieving **Level 5** means that the organization starts the phase of continuous improvement. It is the highest and the most sophisticated stage in project management maturity. At this stage processes in project management are continuously improved. Lessons-learned files after project completion are created and the learned knowledge is discussed in order to avoid mistakes in future projects. Project team members learn from both success and failures. Knowledge learned on projects is transferred to other projects and teams (Kerzner 2001).

The matter of knowledge transfer including experiences and knowledge re-use is the crucial aspect not only for organization at the highest level of maturity ladder but also for those starting in building its maturity in project management.

5. Empirical investigation

The aim of the survey was to investigate knowledge transfer and utility practices in organizations engaged in project management.

Sample

Data was collected through a paper-based questionnaire from 62 persons. The target group consisted of project managers and members of project teams. The survey was conducted in Rzeszow. The sample contained organizations of different size and different industries as well as a broad variety of different projects types and different experiences with project management.

In the sample small projects with less than five project team members account for 27%, medium sized projects: 6-10 persons account for 31%, 11-20 persons account for 19%. Large projects with 21 and more persons account for 23%.

Data collection

The survey was divided into two phases. The first phase aimed to test the suitability and comprehensibility of a designed tool. 3 project managers were asked to complete the paper-based questionnaire and provide feedback on the questions. Based on these comments, the final questionnaire was prepared. During the second phase a survey was conducted. The response rate was 74,7% corresponding to the sample size of n=83 persons.

One part of the questionnaire included questions related to activities which are used by the organization to transfer and utilize project knowledge and experience at different stages of project life cycle (initiation, planning, implementation and closer). The respondents were questioned what types of project knowledge in their organization is registered and utilized. The next part concerned those who are involved in the process of collecting and transferring project knowledge

in the organization and those who are allowed to use the collected and stored knowledge. Another part of the questionnaire included different sources of project knowledge. The respondents assessed the extent of using them in a five-level scale (1 – no use, 2 – used in few projects, 3 – used in about half of the projects, 4 – used in the majority of the projects and 5 – used in all the projects).

Results

This section presents the results from the questionnaire.

Most of the interviewers (60%) mentioned that there is no particular formal system (procedures, policy, forms etc) for project knowledge management and project experiences exchange in their organization.

Among the group of organizations with implemented system for project knowledge management majority mentioned that almost all (frequently) or all (always) initiatives are implemented as projects (Figure 3). It can confirm that knowledge and lessons learned are managed and utilized to a wider extent among organizations which are more experienced in project management.

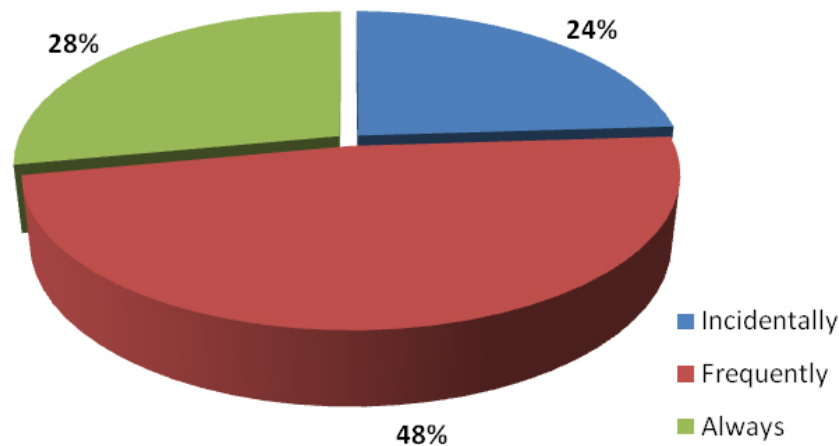


Figure 3. How often are projects implemented in your organization?

Source: Developed for this study.

Taking into account the measures of project management maturity proposed by the above-described models, some simplification has been done to analyze the results of the survey. The interviewed organizations are at the different level of maturity in project management which can be measured by:

- the number of employees who have the qualifications and skills with project management
- the extent to which projects are implemented in the organization (never, incidentally, frequently, always).

An organization at lower level of maturity in project management usually implements projects incidentally. In the organization there is no wide knowledge about project management practices and processes, people are not trained. In the survey they represent the organizations in which: 0% so nobody or 1%-25% of employees have the qualifications and skills in project management and project are implemented incidentally – 39% of the total group of the respondents.

Conversely, a more mature organization leads a number of projects, and skills and practices are formally or informally trained. These are the organizations with 26%-100% of employees who are skilled and qualified in project management and projects are the main operations in their organizations (projects are implemented frequently or always) - 6% of the total group of the respondents.

Lower level of maturity

Among the group of organizations at lower level of maturity, 79% mentioned that knowledge and experiences are not collected, stored and utilized with the support of the formal system of project knowledge management. 46% of the respondents mentioned that no one is involved in gathering and transferring of project knowledge and experiences which are kept only for themselves.

Informal and formal meetings, forums, exchange of information via e-mails were identified as the most frequent sources of project knowledge and experiences. It confirms that the sources used by immature organizations are informal and project knowledge is not collected in a systematic and comprehensive way (Figure 4). The most frequently used knowledge is the re-usage of solutions produced within the previous projects (Figure 5).

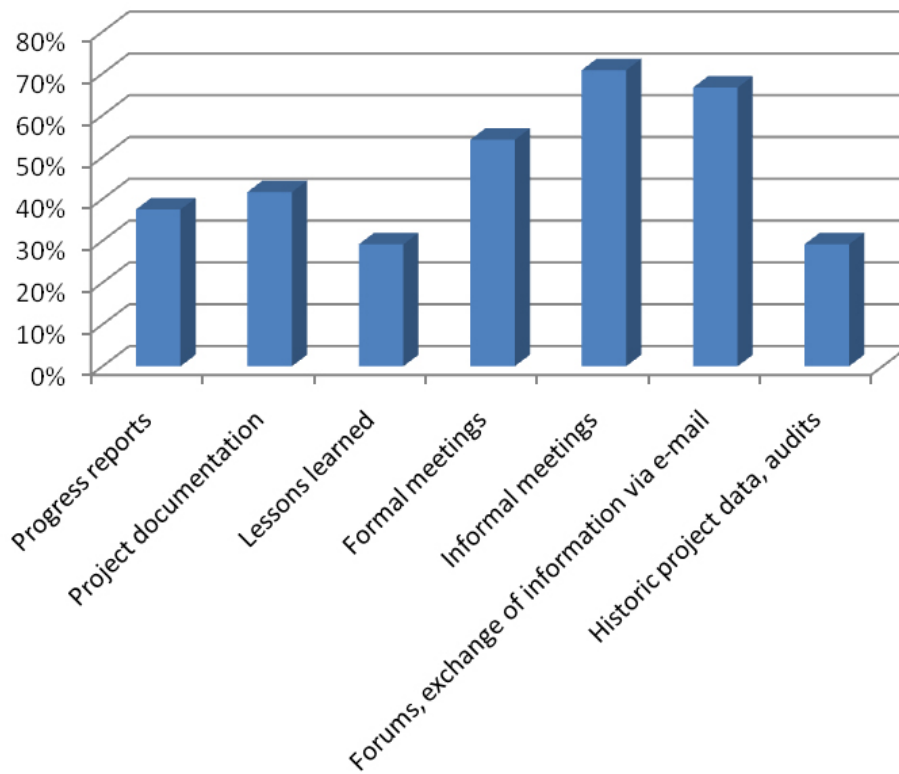


Figure 4. Sources of project knowledge (low maturity)

Source: Developed for this study.

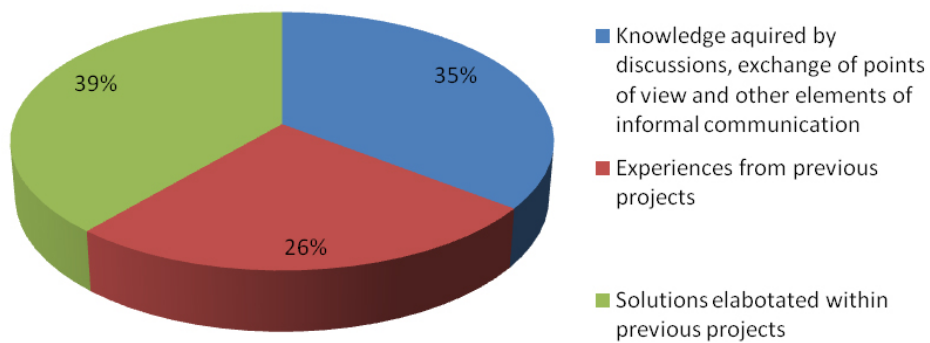


Figure 5. Types of knowledge which is the most frequently used by the organization

Source: Developed for this study.

Higher level of maturity

Only 4 of the interviewed project based organizations mentioned that more than 26% of the employed people are qualified specialists in project management, and all or almost all undertakings are implemented as projects. It can be assumed that those organizations are more professional in project management.

Only one of the respondents confirmed that the system of knowledge and experience management are implemented.

Incorporating experienced people into new project teams has been viewed as the main way to accumulate project knowledge. No respondents considered lessons learned or the exchange of knowledge via e-mails as the sources which are frequently used in their projects (Figure 6).

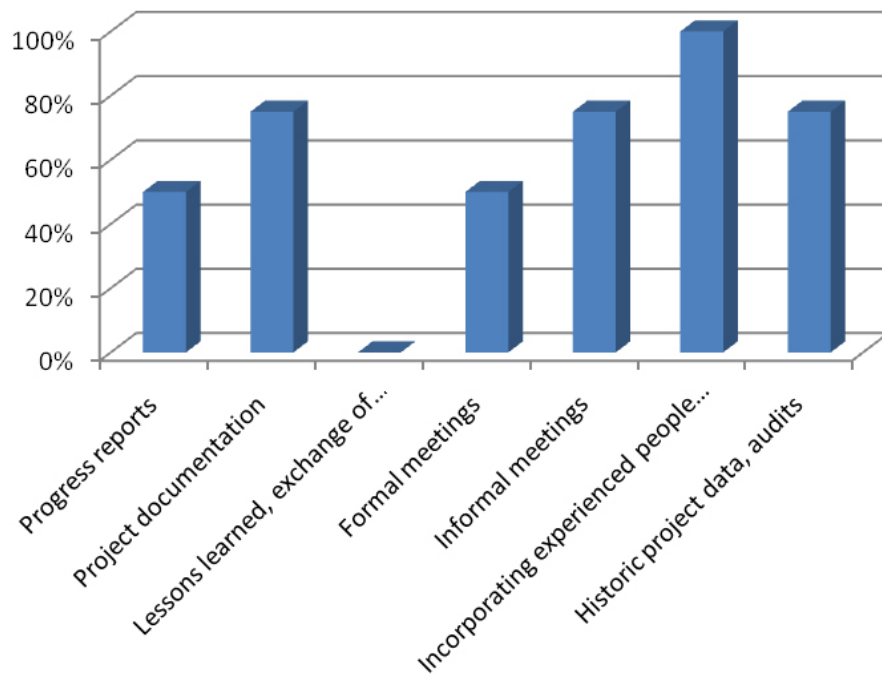


Figure 6. Sources of project knowledge (higher maturity)

Source: Developed for this study.

The role of informal sources of project knowledge and experiences for organizations with higher specialization in project management is less important than for organization with lower maturity. However, the results of the survey expose that collecting and utilizing project knowledge and experiences are important activities no matter the organization's level of maturity. The difference can be mainly in the way and the extent of tools and procedures used.

Conclusions

Knowledge transfer and utilization are prerequisites for changing position at the project management maturity evolution path. A continuous improvement of the practices in collecting and re-usage project knowledge is needed for organizations to be at higher level of proficiency in project management which develops the organization's competitive position in the market of future. Project management performance is based on the knowledge of project team members. Naftanaila (2010) states that "other individuals, either internal or external to the project at hand, can use that knowledge if and only if it is applied and transferred effectively". Efficient knowledge transfer requires not only systems and procedures but also climate for knowledge share. Knowledge transfer between projects enables development of more effective and more sophisticated practices in project management.

The results of the survey confirmed that knowledge is managed and utilized to a wider extent among organizations which are more experienced in project management. The immature organizations do not collect the project knowledge in a systematic way. However, managing project knowledge and experiences are still very important activities, no matter if organization is at the lowest or highest level of maturity.

As little attention has been paid to how effective project knowledge transfer can help in achieving higher level of maturity in project management, this paper has contributed to the description of the importance of project knowledge transfer and utilization in the manner of improving project management maturity.

References

- Andersen E.S., Jessen S.A. (2003), *Project maturity in organizations*. "International Journal of Project Management" Vol. 21, Iss. 6, 457-461.
- Bellini E., Canonico P. (2008), *Knowing communities in project driven organizations: Analyzing the strategic impact of socially constructed HRM practices*. "International Journal of Project Management" Vol. 26, Iss. 1, 44-50.
- Boh W.F. (2007), *Mechanisms for sharing knowledge in project-based organizations*. "Information and Organization" Vol. 17, Iss. 1, 27-58.
- Cooper K.G., Lyneis J.M., Bryant B.J. (2002), *Learning to learn, from past to future*. "International Journal of Project Management" Vol. 20, Iss. 3, 213-219.
- Crawford J.K. (2006), *The project management maturity model*. "Information Systems Management" Vol. 23, Iss. 4, 50-58.
- Crawford L., Pollack J. (2007), *How generic are project management knowledge and practice?* "Project Management Journal" Vol. 38, Iss. 1, 87-96.
- DeFillippi R., Arthur M. (1998), *Paradox in project-based enterprise: the case of film making*. "California Management Review" Vol. 40, Iss. 2, 125-139.
- Desouza K.C., Evaristo J.R. (2006), *Project management offices: A case of knowledge-based archetypes*. "International Journal of Information Management" Vol. 26, Iss. 5, 414-423.
- Disterer G. (2002), *Management of project knowledge and experience*. "Journal of Knowledge Management" Vol. 6, Iss. 5, 512-520.
- Gasik S. (2011), *A Model of Project Knowledge Management*. "Project Management Journal" Vol. 42, Iss. 3, 23-44.
- Hillson D. (2001), *Benchmarking Organizational Project Management Capability*. Proceedings of the Project Management Institute Annual Seminars & Symposium. November 2001.
- Ibbs C.W., Kwak Y.H. (1997), *Measuring project managements return of investment*. "PM Network" 11, 36-38.
- Ibbs C.W., Kwak Y.H. (2000), *Assessing Project Management Maturity*. "Project Management Journal" vol. 31, Iss. 1, 32-43.
- Ibbs C.W., Reginato J.M., Kwak Y.H. (2003), *Developing Project Management Capability: Benchmarking, Maturity, Modeling, Gap Analyses, and ROI Studies in The Wiley Guide to Managing Projects in Pinto J., Morris P.W.G. John Wiley & Sons*.
- International Project Management Association (IPMA), *The IPMA Competence Baseline (ICB)*, version 3,0.
- Jiang J.J., Klein G., Hwang H.G., Huang J., Hung S.Y. (2004), *An exploration of the relationship between software development process maturity and project performance*. "Information & Management" Vol. 41, 279-288.

- Juchniewicz M. (2009), *Dojrzałość projektowa organizacji*. Bizarre, Warszawa.
- Jugdev K., Thomas J. (2002), *Project Management Maturity Models: the silver bullets of competitive advantage?* "Project Management Journal" Vol. 33, Iss: 4, 4-14.
- Kania K. (2011), *Towards a semantic representation of maturity models*. Business Informatics, Ed. M. Owoc. Katowice University of Economics, No. 21/2011, 60-69.
- Kasvi J.J.J., Vartiainen M., Hailikari M. (2003), *Managing knowledge and knowledge competences in project and project organizations*. "International Journal of Project Management" Vol. 21, Iss. 8, 571-582.
- Kerzner H. (2001), *Strategic Planning for Project Management Using a Project Management Maturity Model*. John Willey & Sons, New York.
- Kerzner H., (2004). *Advanced project management*. New Jersey, John Willey & Sons.
- Kwak Y.H., Ibbs C.W. (2002), *Project Management Process Maturity (PM)² Model*. "Journal of Management in Engineering" Vol. 18, Iss. No. 3, 150-155.
- Levin G., Rad P.F. (2007), *Moving forward with project management: A knowledge management methodology*. 2007 PMI Global Congress, Atlanta, Georgia.
- Levin G., Skulmoski G. (2000), *The project management maturity*, "ESI Horizons", Vol. 2, Iss. 3, 1-7.
- Liebesking J.P. (1996), *Knowledge, strategy and the theory of the firm*. "Strategic Management Journal" Vol. 17, 93-107.
- Naftanaila I. (2010), *Factors Affecting Knowledge Transfer in Project Environments*. "Review of International Comparative Management" Vol. 11, Iss. 5, 834-840.
- Nonaka I., Totama R., Nagata A. (2000), *A firm as a knowledge-creating entity: a new perspective on the theory of the firm*. "Industrial and Corporate Change" Vol. 9, Iss. 1, 1-20.
- ODE (2010), *Oxford Dictionary of English Dictionary*. Oxford University Press.
- OGC (2006), *Portfolio, Programme and Project Management Maturity Model (P3M3)*.
- OGC (2010), *Prince 2 Maturity Model (P2MM) version 2.1*, London.
- Pankowska M. (2010), *Project environments for IT projects*. (Informatyka ekonomiczna, Informatyka w zarządzaniu) Ed. Sobieska-Karpinska. University of Economics, Wrocław, 238-253.
- Paulk M.C., Curtis B., Chrissis M.B., Weber Ch.V. (1993), *Capability Maturity Model for Software*, version 1.1. Software Engineering Institute.
- Pennypacker J.S., Grant K.P. (2003), *Project management maturity: an industry benchmark*. "Project Management Journal" Vol. 34, Iss. 1, 4-11.
- Polanyi M. (1966), *The Tacit Dimension*. Doubleday Anchor, New York, 4.
- Prencipe A., Tell F. (2001), *Inter-project learning: processes and outcomes of knowledge codification in project-based firms*. "Research Policy" Vol. 30, Iss. 9, 1373-1394.

- Project Management Institute (2003), *Organizational Project Management Maturity Model (OPM3)*. Knowledge Foundation, Newtown Square, Pennsylvania.
- Project Management Institute (2008), *A Guide to the Project Management Body of Knowledge*, 4th Edition. Project Management Institute, Newtown Square, Pennsylvania.
- Reich B.H., Gemino A., Sauer C. (2012), *Knowledge management and project-based knowledge in it projects: A model and preliminary empirical results*. "International Journal of Project Management" retrieved from: <http://www.sciencedirect.com/science/article/pii/S0263786311001645> (12.04.2012).
- Ruuska I., Vartiainen M. (2005), *Characteristics of knowledge sharing communities in project organizations*. "International Journal of Project Management" Vol. 23, Iss. 5, 374-379.
- Sankarasubramanian S. (2009), *Knowledge management meet project management*. Paper presented at PMI 2009 Asia World Congress, Kuala Lumpur, Malaysia.
- Schindler M., Eppler M.J. (2003), *Harvesting project knowledge: A review of project learning methods and success factors*. "International Journal of Project Management" Vol. 21, Iss. 3, 219-228.
- Smith E.A. (2001), *The role of tacit and explicit knowledge in the workplace*. "Journal of Knowledge Management" Vol. 5, Iss. 4, 311-321.
- Spalek S. (2012), *Zarządzanie wiedzą jako kluczowy element oceny stopnia dojrzałości projektowej organizacji* in: *Innowacje w zarządzaniu i inżynierii produkcji*. Ed. R. Knosal. Oficyna Wydawnicza Polskiego Towarzystwa Zarządzania Produkcją. Retrieved from: http://www.ptzp.org.pl/s82/Konferencja_IZIP_Zakopane_2012_Artykuly (13.04.2012).
- Williams T. (2003), *Learning form projects*. "Journal of the Operational Research Society" Vol. 54, 443-451.