PROJECT MANAGEMENT 1065

PROJECT MANAGEMENT

COMPETENCES OF THE PROJECT MANAGERS IN RELATION TO THE TYPE OF PROJECT

Dejan Petrović*, Marko Mihić, Vladimir Obradović
Faculty of Organizational Sciences, Belgrade
*Corresponding author, e-mail: dejan.petrovic@fon.bg.ac.rs

Abstract: *The paper considers competencies of contemporary project manager in relation to the type of project. The paper starts with an analysis of project types and their influence on project management approach. Competent factors of a project manager are divided and considered in the three separate groups: factors of technical competences, factors of behavioral competences, and factors of contextual competences. The importance of the project manager competencies is connected to the type of the project. The last part of the paper analyses competencies of project manager and project types. The assessment of contemporary project manager competencies should show us directions of further improvement of project manager.*

Keywords*: project manager, project type, technical, behavioral and contextual competencies*

1. INTRODUCTION

Presently, a great variety of different approaches to project management exist. All of these have been developed with the intention of using the previous experiences in project management and applying adequate procedures, methods, and techniques so that the project is implemented in line with the desired objectives. Among the world renowned organizations involved in the development of project management approaches and gathering numerous professionals in the area are IPMA – International Project Management Association and PMI – Project Management Institute. A special feature of the contemporary project management is the use of specialized software tools for project management (Microsoft Office Project, Primavera Professional Project Management …) which are practically indispensable for management of any complex projects.

The role and the position of a project manager are of special significance for the functioning of a project. The project manager is fully responsible for ensuring that the project is implemented in line with the schedule, budget, and quality. But the competencies of the project managers depend on the type of project.

2. ORGANIZATION AND PROJECT TYPE

From the project point of view, organizations can generally be divided into two groups relative to their attitude towards projects:

- Project oriented organizations,
- Organizations which are not project oriented.

Project oriented organizations carry out each of their operations in line with the principles of project organization. This group of organizations includes: construction companies, project design organizations, contracting companies, scientific and research organizations, consultancy companies, aircraft manufacturers, shipbuilding companies, manufacturers of large equipment and plants, marketing agencies, software companies, design centers, military industry and many others.

Organizations which are not project oriented do not perform all of their tasks in line with project management principles, but can nevertheless organize a number of their activities as projects: marketing of new products, research and development of new products and services, construction of new capacities, introduction of new information technology systems, reorganization of the company, capacity building, organization of annual shareholder meeting, moving of the offices, production for a known buyer, and quite a number of other operations. Some researches indicate that up to 50% of the operations of such companies are carried out as projects.

One of the easiest ways to categorize projects in an organization is to group them along the lines of two perspectives: significance of the project and project client. From the point of view of significance, a project can be strategic or operational, whereas from the perspective of the client it may be internal or external.

Using these parameters all projects in an organization may be classified into four groups, as shown in Figure 1.

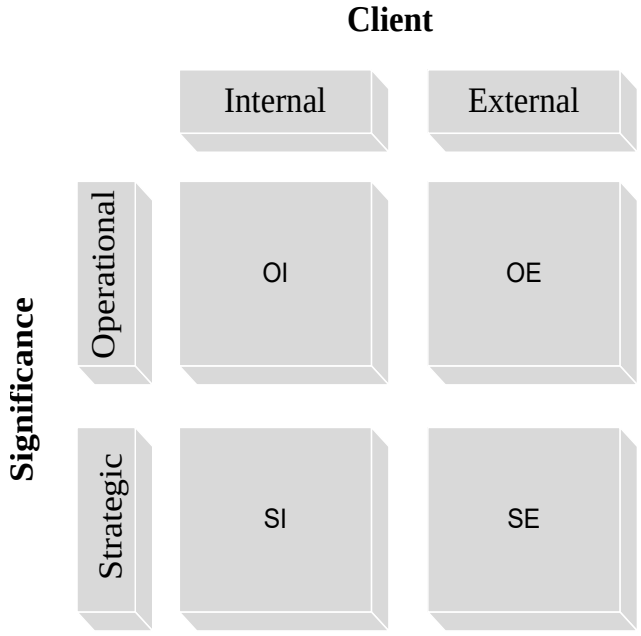

Figure 1: Categorization of projects relative to its significance and client

Project categorization system in organizations may be very complex. A research of literature conducted by Lynn Crawford, Brian Hobbs and Rodney Turner (Crawford et al. 2005) points towards a total of 37 distinctive characteristics that can be used for categorization of the projects. Table 1 shows the most commonly used ones, as well as the characteristics which were considered to be of greatest significance for categorization of projects.

Numerous types of projects are distinguished with respect to the industry in which they are implemented; their purpose; technical structure and other attributes. Each of the types of projects has its distinct attributes which help set them apart from others and define the style of management of their implementation.

Table 1: Comparison of most frequently used and most important attributes of project categorization (Crawford et al. 2005)

Most frequently used characteristics	Most important characteristics
Application area or product	Organizational benefit
Nature of work	Costs
Customer	Customer
Complexity	Application area or product
Costs	Complexity
Scope	Strategic importance
Strategic importance	Risk
Risk	Nature of work
Organizational benefit	Resources
Results	Scope

3. COMPETENCIES OF THE PROJECT MANAGER

The project manager is a person in charge of accomplishment of project objectives. He/she plans, organizes, leads and controls the work of the project team or the organizational unit in charge of project implementation. In smaller size projects, the project manager can also perform some of the project activities. The project team comprises people who are in charge of performing individual tasks or groups of tasks in line with the project manager's instructions. The members of the project team rely on one another and affect each other's work, and together, they work towards achieving the project goals (Jovanović et al. 2009).

To analyze and evaluate the competencies of the project managers, factors for evaluation of those competencies must be identified. It is believed that the successful project management requires a mix of skills, including interpersonal skills, technical competence, and behavioral skills along with the ability to understand the situation and people and to comply the appropriate leadership behavior (Strang, 2003). Research conducted on a series of seminars in project management by Barry Posner's (Meredith, Posner & Mantel, 1995) gave testimony that 1400 different skills are needed a project manager. 1400 of these positions are grouped in 6 field skills of project managers:

- Communication skills (listening, persuasion) - 84% of respondents believe that being a good communicator is the most important skills of project manager,
- Organizational skills (planning, goal setting, analysis) - 75%
- team building skills (empathy, motivation, a sense of loyalty and pride) - 72%
- Leadership skills (showing on the case, energy, vision, delegating, positive attitude) - 68%
- Ability to solve problems and tasks (flexibility, creativity, patience, perseverance) - 59%
- Technological skills (experience, knowledge of the project) - 46%.

El-Sabaa (2001) is, in his research, divided project manager's competencies into three categories:

1. The ability to work with people (mobilization, communication, problem solving situations, delegation of authority, political sensitivity, self-assessment, and enthusiasm);
2. Conceptual and organizational skills (planning, organizing, target orientation, the ability to see the project as a whole, ability to visualize the connection of the project with economic and non-economic subjects, problem orientation);
3. Technical skills (specific skills in the use of methods and techniques, project knowledge, understanding the methods, processes and procedures, technology requirements, the ability to use a computer).

A survey has shown that the relative importance of the ability to work with people estimated by project managers in the field of agriculture is 85.6%, while by the project manager in the field of electro-energy projects amounted to 84.4%, and project managers in the field of information systems 85.9%. The relative importance of conceptual and organizational skills is 77% (project managers in the field of agriculture), 82.9% (project managers in the field of electro-energy projects) and 78.9% (project managers in the field of information systems). Technical skills are, for all tested areas, received the least relative importance by project managers: agriculture - 48.4%, electrical energy - 50.5% and information systems - 52.5%.

The following text will provide a detailed overview of the competency factors based on ICP IPMA Competence Baseline, version 3.0 (IPMA, 2006). IPMA Competence Baseline is a common framework for assessment and certification of project managers promoted by the International Project Management Association – IPMA. IPMA Competence Baseline breaks down professional project management competencies in three broad ranges: technical competences, behavioral competences, and contextual competences. These ranges represent the integration of all elements of project management, together they describe a particular function and are independent for the most part. Each of the areas consists of competence elements which cover the key aspects necessary for successful project management.

The first range is that of technical competences consisting of competence elements that deal directly with the project management matter. In the 'Technical' range the competence elements described are needed to initiate and start, to manage the execution of, and to close and analyze a project. Depending on the kind, size and complexity of the endeavor being carried out, technical competences may apply to management of a project, program or portfolio.

In the technical range, the competence elements of a project manager include the so called “solid” elements of project management. The technical competences consist of the following twenty competence elements:

- **Project Management Success.** Achieving the project, program or portfolio objectives within the agreed constraints is a result of the competence of the project manager to integrate and balance among the requirements, activities and project results. This element also entails the capacity of project managers to analyze the effort underway, define the plan and procedures, implement the plan and bring the project to successful closure.
- **Interested Parties (Stakeholders).** This competence element refers to the capacity of the project manager to identify and analyze the interested parties, develop a strategy, define a plan and ensure that they are satisfied in each of the project phases.
- **Project Requirements and Objectives.** The project manager should be able to clearly identify project requirements, develop a business case, define objectives, validate requirements at key points in the project lifecycle and constantly assess compliance with the project objectives and implement the project in line with the previously defined requirements and agreed objectives.
- **Risks and Opportunities.** This element includes the competences of the project manager to identify risks and opportunities in the project, analyze possible consequences, develop a risk and opportunity response plan and regularly control and update the risk and opportunity response plan.
- **Quality.** The project manager is supposed to ensure that the project requirements are met in line with the main purpose for which the project is developed. This process entails development of the quality plan, quality assurance, and quality control.
- **Project organization.** Project organization covers the competence of the project manager to design appropriate organizational structure, identify the necessary resources and define the appropriate roles, levels of responsibility, procedures and means of communication.
- **Teamwork.** This competence element covers the competence of the project manager to build a team, develop a common sense of purpose, belonging and commitment and constantly improve the quality of work performed.
- **Problem Resolution.** This competence includes defining procedures for detecting problems, analyzing problems and identifying their root causes, capturing ideas to solve a problem and selection of possible solutions and implementation of the selected solution.
- **Project Structures.** A project manager should possess the appropriate knowledge to analyze and define different project structures by using methods such as WBS, PBS, OBS, etc.
- **Scope and Deliverables.** The purpose is to assess what needs to be done and what is covered by the project scope that has to be carried out for the project to finish successfully and produce the desired results.
- **Time and Project Phases.** This covers the project manager competences to implement the project within the approved schedule. It includes structuring, sequencing, estimating the duration and scheduling of the activities, including the monitoring and control of timely execution of the project activities.
- **Resources.** This is the capacity of a project manager to identify the necessary resources, develop a resource plan, optimize the use of resources, and monitor and control the use of resources.
- **Costs and Finance.** A project manager must have the capacity to adequately perform all activities related to planning, monitoring and control of the costs in the phases of project preparation and implementation.
- **Procurement and Contract.** This is the capacity of a project manager to obtain the best value for money of goods and services from project vendors and suppliers.
- **Changes.** A project manager should have the capacity to identify all proposed changes, analyze their consequences to the project, get the changes accepted or rejected, as well as to plan, execute and control the approved changes.
- **Control and Reports.** Includes the capacity to measure the actual progress and project performance, compare them with the plan, provide information to all project participants and stakeholders and undertake appropriate corrective actions.
- **Information and documentation.** This entails the capacity of a project manager to manage information and documentation by establishing appropriate information systems and defining documentation management procedures.

- **Communication.** A project manager should have the capacity to effectively manage project communications by developing communication plans, disseminating information and developing comprehensive reports.
- **Start-up.** Start up competence element entails the process steps such as initiating start up process, developing a detailed project management plan, securing resources and formal agreements to start the project.
- **Close-out.** Close-out refers to the competences to plan and carry out activities related to the completion of a project, handing over of the operational documents, agree on a process to resolve open issues, complete all financial transactions and update the final costs, conduct a comprehensive review of the project and record the lessons learned.

Behavioral competence range covers competence elements such as personal behavior and project management related behavior. This range also covers opinions and skills of the project manager. This is a set of different competency elements, which are relevant to the project manager, and project manager's competences in managing relations with the people in the project and the project stakeholders:

- **Leadership.** Leadership involves the capacity of a project manager to provide direction and motivate others in their role or task to fulfil the project objectives. Leadership is particularly important when a project encounters problems, where change is required or where there is uncertainty about the course of action.
- **Engagement and motivation.** Is the personal buy in from the project manager and from the people inside and associated with the project.
- **Self-control.** This is a systematic and disciplined approach of the project manager to coping with the daily work, changing requirements and stressful situations.
- **Assertiveness.** This is the ability of the project manager to his/her views clearly, persuasively and authoritatively.
- **Relaxation.** It Is the ability of a project manager to relax, recuperate and regroup after stressful events and react and make decisions in the light of the new circumstances.
- **Openness.** Openness is the ability of the project manager to make others feel they are welcome to express their suggestions, worries and concerns that the project can benefit from. Openness is an important competence and is a means to use knowledge and expertise of others.
- **Creativity.** Creativity is the capacity of the project manager to think and act in an original and innovative way. The project manager should exploit and encourage the creativity of individuals and the collective creativity of the project team, to obtain better results in the project.
- **Results Orientation.** This means the capacity of the project manager to focus the attention and attention of the project team on key objectives to obtain the optimum outcome for all the parties involved, so that the project results satisfy the interested parties.
- **Efficiency.** This is the ability of the project manager to use the time and resources in a cost effective manner in order to produce the agreed deliverables with as little investment as possible.
- **Consultation.** This is the competence of the project manager to reason, present solid arguments, to listen to other points of view, to negotiate and to find solutions.
- **Negotiations.** Negotiations are the means by which the project manager can resolve disagreements concerned with the project or programme to arrive at a mutually satisfactory solution. A well developed ability to negotiate can help the project manager to avoid real conflicts.
- **Conflict and crisis.** This competence element covers ways that the project manager handles conflicts and crises that can arise between different individuals and parties involved in a project or programme.
- **Reliability.** A reliable project manager builds trust with others by delivering on the promises made. Reliability covers responsibility, correct behaviour, robustness, and confidence.
- **Values appreciation.** This is the ability to perceive intrinsic qualities in other people and understand their point of view. It also covers the ability to communicate with them and be receptive to their opinions, value judgements, and ethical standards.
- **Ethics.** This competence element embraces the morally accepted conduct or behavior of the project manager.

Contextual competence elements describe the competence of the project manager to manage relations with the parent company and the competence to operate in a project focused organization. Contextual competences may be divided as project management in permanent organizations, and links between managing a project and managing a work of the organization. Contextual competence elements include elements that describe the concepts of projects, programs and portfolios and represent a connection between these concepts and the organization or between organizations, which are involved in the project. Understanding these concepts for project implementation is one of the most critical elements of the effective work of a project manager.

- **Project Orientation.** Project managers should have sufficient knowledge about managing project-oriented organizations.
- **Program Orientation.** This is the element of competence covers the competence of a project manager to develop and apply project management related knowledge.
- **Portfolio Orientation.** This is the capacity of the project manager to prioritize organization's projects and/or programs and optimize business improvement initiatives of the projects and programs to the organizational objectives.
- **Project, program and portfolio orientation.** This covers the processes of introduction and continuous improvement of the project, program and portfolio management in organizations.
- **Permanent Organization.** This competence element covers the relationship between the project organizations that are temporary and the permanent entities of the line managed organization contributing to or interfacing with the project work.
- **Business.** In order to be fully effective and efficient, project manager needs to fit into the business environment. Project, programme and portfolio management are linked to the organization's strategy.
- **Systems, products and technology.** This competence element covers the linkage between a project/programme and the organization regarding systems, products and/or technology.
- **Personnel Management.** This element covers aspects of project manager's competences related to projects and/or programmes including planning, recruitment, selection, training, retention, performance assessment, and motivation.
- **Health, security, safety and environment.** This element covers the activities of project manager that help ensure the organization, i.e. implementation project results, behaves appropriately in the context of health, security, safety and the environment.
- **Finance.** This element covers the financial context within which the organization operates. The project manager must provide information to the financial management of the organisation about the financial requirements of the project and co-operate in accessing the funds, checking payments and controlling the use of such funds.
- **Legal.** The project manager must operate within the legal boundaries and recognize the aspects of law applicable to the particular project or programme and which derive from the project or programme itself.

4. COMPETENCIES OF PROJECT MANAGER AND PROJECT TYPE

The project manager does not have to have specialized skills and knowledge for all tasks carried out in the project. The work of the project manager does not entail narrow specialization in a particular subject matter within the project scope. In order to efficiently perform the job, it is essential for the project manager to undergo appropriate training to acquire adequate knowledge and skills of project management and thus properly coordinate and direct the activities and stakeholders to achieve the desired project goals (Muller & Turner, 2010). The project manager must possess knowledge and understanding of economic and technical characteristics of the project activities to manage them adequately and make appropriate decisions (Oehmen, 2012).

The organizational structure of small size projects involving a small number of people is relatively simple. In these projects, the project manager can fairly easily and directly manage all individuals in the project. However, as the project expands so does the system of management, and the scope of control that one project manager may have over the activities is becoming restricted.

Technical expertise is one of the oldest skills that are required by the project manager. Most organizations today believes that a successful project manager requires a good knowledge of the area where the project is implemented (Levin, 2014). This attitude is related to the view that the project manager cannot be recognized

by the team if it is not a technical expert if it is unable to plan an elegant technical solutions, solve technical problems and identify possible technical problems regardless of the type of project (Muller & Turner, 2007).

It is certain that a particular expertise in the area where the project is implemented necessary for successful project management, but the question is what the level of knowledge necessary for the success of the project is. There is no universal answer to this question, but mostly depends on the type of the project and individual approach. Individuals who focus on the word "project" think that a perfect knowledge of the area where the project is implemented is critical, while on the other hand, individuals who emphasize the word "manager" believe in the expertise of its project team. The above mentioned research shows that knowledge of the area where the project is implemented is not a necessary factor for the successful conduct of the project, but some knowledge of the area in which it is implemented is necessary. Most of the problems in project implementation, which occur due to the project manager, are related to ineffective project management, but not for a lack of technical expertise.

Ability to work with the client / user can bind to the modern project manager for all types of projects. This ability has evolved from demands for basic communication and the need to see the project from the perspective of the client or user.

One of the most important characteristics of the modern project manager is the ability to plan the project into line with the impact of the project on business and adjust the implementation of the project so as to obtain relevant business results for the organization.

Ability to use appropriate methods and techniques of project management also falls into the classic skills of project managers. Today's project managers the ability to be more reflected in adapting the methodology of project management in accordance with different characteristics and type of the project. A successful project manager is also reflected in the ability to use methods and techniques of project management in order to recognize problems early enough and predicted solutions before problems have a significant impact on the results of the project.

The strategic ability of project managers is also a feature of the modern project manager (Levin, Ward, 2011). Due to the need for agility of organization, project manager no longer has the luxury of implementing the project out of close coordination with the strategic guidelines of the organization. The project manager must understand the strategy of the organization and customer/client and for each type of project has to review whether it is in accordance with the strategic goals of the organization. The project manager needs to fine-tune the project in accordance with changes in business strategy so that the project continues to be relevant to the organization or client. The project manager must be prepared for rapid changes in the priorities of the contracting authority of the project.

The ability to build a team and motivate the project team is now accepted as a necessary ability for all type of projects because technical knowledge of the project manager is not enough to motivate the project team members. Project managers usually borrow people from the functional units and therefore they need additional knowledge how to develop project team. The project manager should allocate tasks so as to keep the project team clearly focused on results and to encourage members of the project team so that they feel responsible for the achievement of project results.

Ability to solve problems has always been a desirable ability to project managers by the organization. This is often linked with the view that a project manager needs to be an expert in the area where the project is carried out. Today, however, the complexity of the project is much higher than before (and continues to grow) and the number of areas in the project for which the project manager needs to be an expert. Instead to expand the ability of problem solving, the contemporary project manager should have the ability to build the capacity of the team to effectively solve problems.

One of the capabilities of the modern project manager is possession of cultural intelligence. In a globally connected world, projects are no longer limited to one location nor are the users only at one location. Today, the resources and users are globally located, and the project manager should be able to accept the knowledge and skills as well as the specificities of cultures that individuals bring with them.

Capabilities that distinguish successful project managers at small projects are not also the skills that are essential in large projects. Desirable skills of project managers are changing in relation to the size of the team, as well as in relation to how the project includes various functional units or exceeds the boundaries of the organization, and whether the project is strategic or more operationally oriented.

The stronger expertise of project managers will lead small projects to success because personal knowledge and personal skills allow the project manager to successfully solve problems. But this approach has no meaning when the number of members of the project team is bigger. If the project takes place within a single functional entity conflicts and potential problems is much smaller. But if the scope of the project includes a larger and more functional units, then by the project manager requires different skills. If the project has to improve the existing functionality, then the focus is not on the ability of the strategic vision of the project managers. But if the project aims to achieve strategic results for the client's business, then the project manager should have the ability to see through the technical aspects of the project and to run the project according to the desired business results.

5. CONCLUSION

The paper presents the most important competencies of project manager in relation to the type of project. Organizations have to assess existing skills of project managers and check how they comply with the current requirements of the relevant organizations in the field of project management and trends in this area. Evaluation of project manager's competencies should allow defining directions of their further development.

When the number of projects increases in the organization (usually when the organization grows) the performance of project managers no longer depends only on his abilities and ways of implementation of the role, but also the willingness of the organization to adapt appropriate approach for projects execution. In this case it is necessary to reduce the so-called "feudal" relationship and hierarchy among organizational units and give project managers the authority to directly allocate resources and rewards individuals from the functional units. This is often a great change, but without it, there is little possibility that they will ever have a good track record on projects that include several functional units. Also, the introduction of the multiproject management principles into the organization will help project managers about assigning priorities and resource allocation.

Many things have influence that someone become a successful project manager. But project success comes from the ability of project managers to justify himself with the needs of each project. Project managers who are improving their skills in accordance with the requirements of modern project management can expect to be successful in the future regardless of the type of project.

REFERENCES

Crawford, L., Hobbs, J.B., Turner, J.R. (2005). Project Categorization Systems: Aligning Capability With Strategy for Better Results. Project Management Institute, Newtown Square.

El-Sabaa S. (2001). The skills and career path of an effective project manager, International Journal of Project Management, 19.

International Project Management Association (2006). ICB – IPMA Competence Baseline, Version 3.0.

Jovanović, P. (2015). Upravljanje projektom. Beograd: Visoka škola za projektni menadžment.

Levin G. (2014) Key Competencies for Success in Navigating Complexity. White paper. Project Management Institute, Inc.

Levin, G., & Ward, J.L. (2011). Program management complexity: A competency model. Boca Raton, FL: CRC Press.

Meredith R, Posner BZ, Mantel SJ Jr. (1995). Project management: a managerial approach. New York: John Wiley.

Muller R, Turner R. (2007) Matching the project manager's leadership style to project type. International Journal of Project Management 25. 21–32

Muller R, Turner R. (2010) Leadership competency profiles of successful project managers. International Journal of Project Management 28. 437–448

Oehmen, J. (Ed.) (2012). The guide to lean enablers for managing engineering programs. MIT-PMI-INCOSE. Massachusetts Institute of Technology, International Council for Systems Engineering & Project Management Institute.

Strang, K.D. (2003). Achieving organizational learning across projects. In: Paper presented at the PMI North America global congress 2003, Baltimore, USA.

KNOWLEDGE SHARING IN PROJECT ENVIRONMENT

Marija Todorović[*1], Danijela Toljaga-Nikolić[1], Zorica Mitrović[1]
[1]Faculty of organizational sciences, University of Belgrade
*Corresponding author, e-mail: todorovicm@fon.bg.ac.rs

Abstract: *This paper presents discuss the topic of knowledge sharing in project environment.There is an awareness of the fact that knowledge sharing between projects increases organizational knowledge and add value to future project and the performing organization. On the other hand, literature and a number of researces showed that there are different mechanisms that can be used to share knowledge, depending of project characteristics. This papers analysis literature on knowledge sharing in project environment, relying on knowledge acquisition and creation of new knowledge. Paper also present the results of empirical research conducted in Serbia to reveal what are the most frequently used mechanisams to share knowledge between project – formal or informal.*

Keywords*: project, knowledge, project environment*

1. INTRODUCTION

Knowledge sharing between projects increases organizational knowledge. Each project has different plans, results, problems and the level of performances which gives plenty of opportunities for learning. By integrating and sharing of such experiences between projects a company can create the significant base of organizational knowledge for future endeavors. The existence and development of the knowledge base in the organization has a significant effect on the strategic development of an organization (Szulanski, 1996; Nagarajan & Mitchell, 1998).

Cooper et al. (2002) present a dynamic process of learning between projects, which can be used by managers to test ideas, see impacts and capture best practices. The conclusion is that the procedures for the acquisition of knowledge and dissemination of lessons learned should be organized. However, learning within the project does not happen naturally, it is a complex process which needs to be managed (Todorovic et al., 2015). The learning process can not exist in isolation from other processes, and organizational learning is impossible unless it is seen as a supplement to other processes. Sense (2007) highlights the following five factors that influence the creation of a learning environment: cognitive style, the relationship between the participants in the learning process, the hierarchical scale, knowledge management and situational context. Arthur, DeFillippi i Jones (2001) also emphasize the foundation of the project success on learning, classifying the success of the project in terms of performances and aspects of learning. Knowledge generated by learning from the projects could lead to far-reaching changes in the strategic focus of the organization (Brady & Davies, 2004). One of the most recent papers in the field of knowledge management between projects confirms the hypothesis that an appropriate environment, including social and technological aspects, enable knowledge management process and has a significantly positive impact on documenting of project knowledge (Reich et al., 2012).

2. KNOWLEDGE ACQUISITION IN PROJECT ENVIRONMENT

The ways of acquiring of organizational knowledge include: the usage of knowledge that already exists in the organization or gathering knowledge that exists outside the organization, instructions or direct transmission of knowledge from the people who own it, observation and notification of problem solving, brainstorming, protocol analysis e.g. experts are required to express their thoughts in solving problems aloud, nominal group technique, Delphi technique, etc. To acquire knowledge in project environment following steps need to be implemented: use of certain assets in order to collect information from people involved in the project; interpretation of information and draw conclusions based on the of experts knowledge and their judgment; the usage of those interpretations to form policies that represent the thinking of people who have experience of working on projects.

3. KNOWLEDGE SHARING IN PROJECT ENVIRONMENT

Acquired knowledge becomes information and the process of sharing knowledge should enable not just a simple transfer of such information but transfer of knowledge to new users in their context and then move into knowledge. The process, which involves the adoption of new information and linking them with existing

knowledge and experience, is a learning process. Learning and knowledge are separate but related processes in terms of learning to create knowledge, and expertise to influence the future of learning (Lyles & Easterby-Smith, 2003).

The process of knowledge sharing is in the literature often treated as a black box (Berends, 2005). The knowledge gained is not always completely and without any changes useful to the project. It can be either to extensive or too specific. In other words, it is necessary to adapt the requirements of a particular project. The process that enables this is the process of *knowledge creation*, based on existing knowledge gathered within and outside the organization, adapting it to the needs of the project.

The knowledge sharing can be seen as a process of reconstruction of knowledge, not as a simple act of sending and receiving of organizational knowledge (Abou-Zeid, 2005). In other words, when we talk about the knowledge transfer, but without the creation of new knowledge without an existing organization, then we can talk just about information transfer (Boder, 2006).

Knowledge creation can be accessed through a variety of ways such as training, hiring external resources, recruiting people of different profiles in order to create fresh knowledge base. This is a question of innovation - effectively turning ideas into action. The challenge is not to lose creative ideas and allow them to flow wherever they can be used. Most often the difference between the old and new knowledge is not always clear. Innovation can often be drawn from the lessons of the past. The application of old knowledge almost always involves some adaptation and in the process creates new knowledge. In the end, the quality of knowledge does not depend on the fact whether it is old or new, but whether it is relevant. The following text of this paper is focused more on the process of knowledge creation, the process of integration of project knowledge.

4. KNOWLEDGE INTEGRATION IN PROJECT ENVIRONMENT

Integrating knowledge present the set of activities of team members that share individual knowledge and combine them to create new knowledge (Okhuysen & Eisenhardt, 2002). The core activities of any project-oriented organization is a coordination which is achieved through the active participation of individual specialists and managers. Such coordination can not be achieved without access to an adequate knowledge.

In many project there are multifunctional teams reither than functional teams. Multifunctional teams are formed under the assumption that they will combine specialized knowledge in different organizational units. However the way in which knowledge will be integrated remains often poorly explained. Multifunctional teams are typical for the following three situations: when the focus is on creativity and innovation, when you need to reach a consensus through community input, negotiation, or investigation and when it is necessary to manage strategic change.

The integration of knowledge collected from various projects has its economic value, because the organizational competitiveness is affected by diversity and strategic value of specialized knowledge and also the organization's ability to integrate knowledge effectively. An organization's ability to integrate knowledge depends on the mode of communication and working procedures (routines) and the way in which implicit knowledge into explicit codified rules. On the efficiency of the process of integration of knowledge affects the existence and developed knowledge among the participants, coordination and organizational structure (Papke-Sields, Beise, & Quan, 2010).

Despite the existence of knowledge that should be integrated, one of the necessary preconditions is the common basis between users of this knowledge. E.g. in the case of sharing knowledge for the development of a new trade system between technicians and sales managers, the key point is that sales have basic knowledge about the technology to be applied, a technician basic knowledge about the process of trade. Coordination is a process that must be constantly improved. In addition, the very organizational structure affects efficiency and effectiveness through the integration of knowledge way to connect the activities and tasks that are running.

The greater scope of knowledge that should be integrated, the lower is the efficiency of knowledge integration. The greater the volume of knowledge requires better coordination, and organizations that do not have a lot of experience in this process becoming less efficient in this process. On the other hand, a larger scope of knowledge strengthens the competitiveness of organizations and reduces the chance for copying from other organization. Flexibility of the process of integration of knowledge depends on the organization's ability to reconfigure existing knowledge by promoting innovation (Love et al., 2005).

The above theoretical assumptions are tested on four projects: the introduction of ERP systems, the development of new banking services, business process redesign, introduction of management systems they know (Love et al., 2005) The first conclusion is that the formation of common knowledge in multifunctional teams depends on the perception the value of the project by the stakeholders (of their support); the second thing is the previous experience of the organization in the implementation of complex projects.

Further, knowledge sharing is associated with the existence of objective measures, that explain the purpose of the project results. The way of communication among team members, sharing "narrative story," was significantly conditioned by the organizational structure in all four projects. However, it was noted that the exchange of knowledge in an informal way the project is affected by culture, or accepted the values and principles of conduct by members of the team. In this part of the practice is different from theory. According to this study, the level of efficiency in the context of multifunctional projects depends precisely on the communication process, how to manage social capital and how organizational structure contributes to the development of social capital.

Prencipe (2001) based on the collection of data through interviews and questionnaires with projects from six organizations developed a schematic view of learning as an attempt to create a pattern for learning process between projects. First, the organization is divided into three kategoije: social projects where prevailing social processes and work with people; technical projects with clearly articulated processes and ICT projects. For each of the three project's categories the author developed a matrix that shows the mechanism for the accumulation of experience, knowledge articulation and codification of knowledge.

Table 1. Social projects

	Learning process		
Level of the analysis	*Acumulation of experience*	*Knowledge articulation*	*Knowledge codification*
Individual level	• On-the-job training • Job rotation • Specialization	• Figurative thinking • Thinking aloud • Notes	• Diary • Reporting system • Individual system design
Project level	• Reuse of experts • Developed group thinking • Face-to-face communication • Informal encounters • Imitation	• Brainstorming • Formal project reviews • Debriefing meetengs • Ad hoc meetings • Lessons/learned/post-mortem meetings • Intraproject correspondence	• Project plan • Milestones • Meeting minutes • Project history files • Intraproject lessons learned database
Organizational level	• Informal organizational rutines, rules and selection processes • Departmentalization and specialization • Communities of practice	• Project manager camps • Knowledge rereats • Professional network • Knowledge facilitators and managers • Interprojet correspondence • Interproject meeting	• Drawings • Process maps • Project management process • Lessons learned data base

Table 1 present "L" form, that has a social approach. The emphasis is on creating and sharing tacit knowledge, based on experience through joint work on the project. Contacts face to face and via social media have great significance. Learning between projects has more informal character and involves sedimentation of new practices in the form of routine.

Table 2. Techical projects

Level of the analysis	*Learning process*		
	Acumulation of experience	*Knowledge articulation*	*Knowledge codification*
Individual level	• On-the-job training • Job rotation • Specialization	• Figurative thinking • Thinking aloud • Notes	• Diary • Reporting system • Individual system design
Project level	• Reuse of experts • Developed group thinking • Face-to-face communication • Informal encounters • Imitation	• Brainstorming • Formal project reviews • Debriefing meetengs • Ad hoc meetings • Lessons/learned/post-mortem meetings • Intraproject correspondence	• Project plan • Milestones • Meeting minutes • Project history files • Intraproject lessons learned database
Organizational level	• Informal organizational rutines, rules and selection processes • Departmentalization and specialization • Communities of practice	• Project manager camps • Knowledge rereats • Professional network • Knowledge facilitators and managers • Interprojet correspondence • Interproject meeting	• Drawings • Process maps • Project management process • Lessons learned data base

Table 2 present "T" shape that has a technical approach and is characteristic of the organization attach importance to the articulation process at all levels. Meetings are often organized in order to improve communication and knowledge transfer.

Form "steps" (shown in Table 3) refers to organizations with developed advanced ICT tools to support learning between projects. Their efforts are focused on the codification and storage of knowledge developed during the execution of the project and its documentation in order to be used on other projects. These processes are aimed at creating and renewing formal procedures.

This approach is presented by Prencipe (2001) and have been modified by Love et al (2005) who state that is arguably how an extremely dynamic process of learning between projects can be presented by static matrix. In addition, looking at the phases and types of projects can be concluded that in relation to them a learning mechanism can be more acceptable than another.

For example. face to face communication and meetings are appropriate for the activities of problem solving and creative activities that are present usually at the beginning and end of the project, while the processes based mechanisms are more appropriate in the phases of the project in which the plans are already in place.

However, the above scheme represents a good starting point for presenting similarities in learning styles between projects in different organizations.

Table 3. ICT projects

Level of the analysis	*Learning process*		
	Acumulation of experience	*Knowledge articulation*	*Knowledge codification*
Individual level	• On-the-job training • Job rotation • Specialization	• Figurative thinking • Thinking aloud • Notes	• Diary • Reporting system • Individual system design
Project level	• Reuse of experts • Developed group thinking • Face-to-face communication • Informal encounters • Imitation	• Brainstorming • Formal project reviews • Debriefing meetings • Ad hoc meetings • Lessons/learned/post-mortem meetings • Intraproject correspondence	• Project plan • Milestones • Meeting minutes • Project history files • Intraproject lessons learned database
Organizational level	• Informal organizational rutines, rules and selection processes • Departmentalization and specialization • Communities of practice	• Project manager camps • Knowledge rereats • Professional network • Knowledge facilitators and managers • Interprojet correspondence • Interproject meeting	• Drawings • Process maps • Project management process • Lessons learned data base

5. KNOWLEDGE SHARING IN PROJECT ENVIRONMENT IN SERBIA

In order to investigate what are the most frequently used mechanisms for knowledge sharing, a reserch was conducted. The questions were design to find out do the respondents use more formal (documented) or informal ways to acquire and share knowledge in project environment. More than 100 questionnaires were collected from participants on project from different industries (construction, processing industry, metal industry, wood industry, trade, public sector, healthcare, architecture, design, etc.)

Research results show that 72% of respondents answerd that they have some documented procedure for project management in their organizations. On question what area of project management are regulated the most, the results show that project planing, monitoring, control and reporting are regulated in a very high level, hence project initiation and selection are in the most of partially or even not regulated.

Since the purpose of this research was to discover wherther team members use a systematic approach to acquire and share knowledge between project the question were oriented on how they treat the problems, risk and changes on their project/is there any documented file on those issuess; do they always create a final report on competed project or this action is not a common practice; and what are the most frequently used mechanism for knowledge sharing: project files/reports or less formal communication.

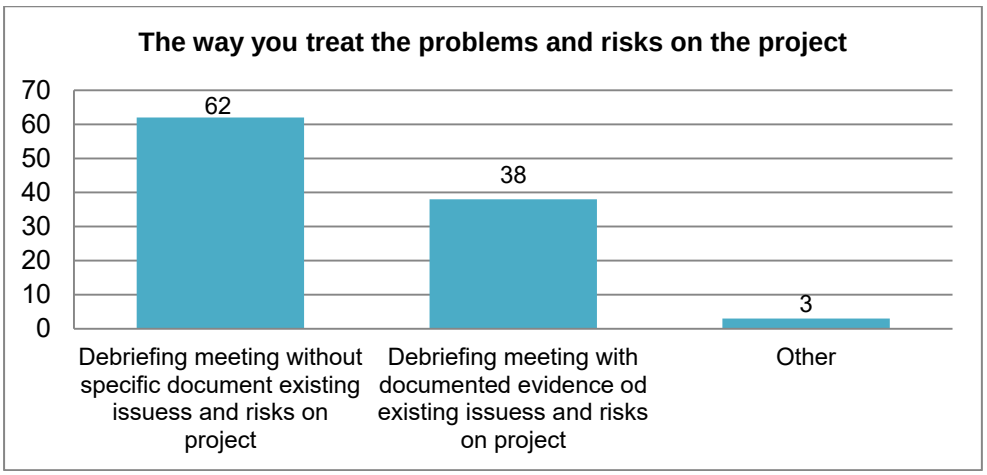

Figure 1. The way you treat the problems and risks on the project

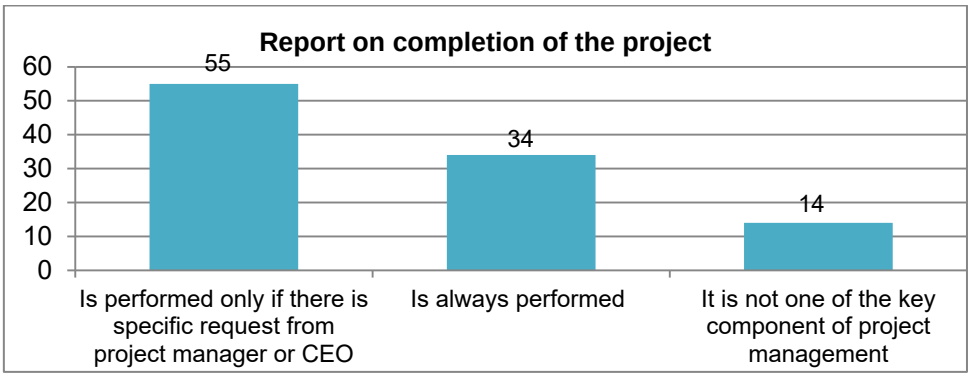

Figure 2. Report on compleation of the project

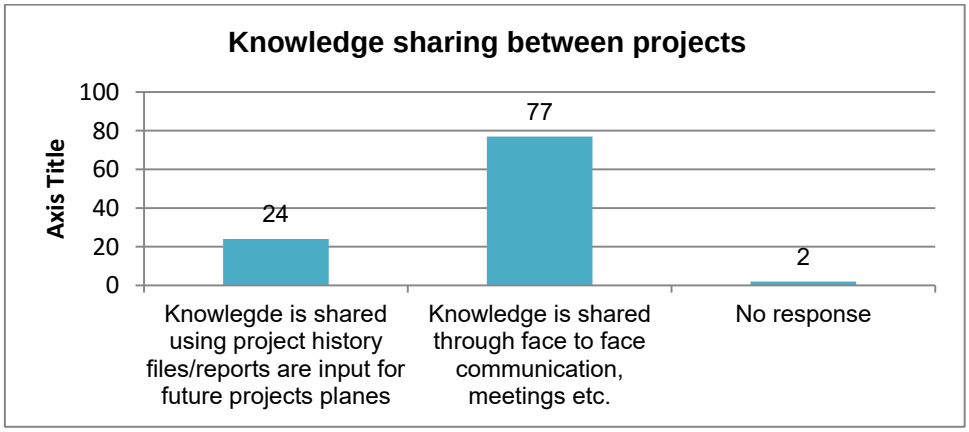

Figure 3. Knowledge sharing between projects

Results showed that respondants use mostly unformal mechsnisms to share knowledge between projects. Around 60% of respondants answer that discuss project risks and problems but that they don't have a procedure to document those issues. Only 38% answered that they document all project problems and risks. Final report on compliteted project is always performed in only 34%, in more than 50% final report is performed only if CEO or project manager request it.

From the perception of the respondants knowledge between project is shared mostly using informal communication, meetings, experts reusage. Only 24% of them said that they use files/reports from preveuos projects to acquire information and knowledge.

6. CONCLUSION

Through literature review it can be concluded that the key factors of influence on knowledge sharing process in project environment are: organizational culture, organizactional structure, stakeholder support, and the level of coordination of this process along with other procesess in project. Literature points on significance of

knowledge sharing between projects for organizational knowledge. Literature also shows that there are different mechanisms to acquire, articulate and codify knowledge beetwen projects in accordance to project characteristics. However, in the practice there is an evidence of knowledge sharing using mostly informal ways instead of formal processes. It is not doubtfull that knowledge can and should be shared using informal ways and that benefits of tacit knowledge can be achieved, but the question is how much informations and knowledge are passed if there is no formal evidence of project realization (problems, risks, changes and other issues, compliation etc.) and the usage of project history files for future projects.

REFERENCES

Abou-Zeid, E. (2005). A culturally aware model of inter-organizational knowledge transfer. Knowledge Management Research & Practice, 3 (3), 146-155.

Arthur, M. B., DeFillippi, R. J., & Jones, C. (2001). Project-based learning as the interplay of career and company non-financial capital. *Management Learning, 32*, 99-117.

Berends, H. (2005). Exploring knowledge sharing: moves, problem solving and justification. *Knowledge Management Research & Practice , 3* (2), 97-105.

Boder, A. (2006). Collective intelligence: a keystone in knowledge management. *Journal of Knowledge Management, 10* (1), 81-93.

Brady, T., & Davies, A. (2004). Building project capabilities: From exploratory to exploitative. *learning, 25*, 1601-1622.

Brooks, N., Morton, S., Dainty, A., & Burns, N. (2006). Social processes, patterns and practices and project knowledge management: A theoretical framework and an empirical investigation. *International Journal of Project Management , 24*, 474-482.

Cook, S., & Brown, J. (1999). Bridging epistemologies: the generative dance between organizational knowledge and organizational knowing. *Organization Science , 10* (4), 381-400.

Cooper, K. G., Lyneis, J. M., & Bryant, B. J. (2002). Learning to learn, from past to future. *International Journal of Project Management , 20*, 213-219.

Davenport, T., De Long, D., & Beers, M. (1998). Successful Knowledge Management Projects. *Sloan Management Review*, 43-57.

Desouza, C., & Evaristo, R. (2006). Project mAnagement office: A case of knowledge-based archetypes. *International Journal of Information Management , 26*, 414-423.

Grant, R. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal , 17*, 109-122.

Lindquist, L., Soderlund, J., & Frohm, C. (2002). *Knowledge Management in Technology and Project Based Firms.* East Horsley, UK: EuroProjex Ltd.

Love, E., Fong, S., & Irani, Z. (2005). *Management od Knowledge in Project Environment.* Burlington: Elsevier Ltd.

Lyles, M., & Easterby-Smith, M. (2003). *The Blackwell Handbook of Organizational Learning and Knowledge Management.* Oxford: Blackwell Publishing.

McDermott, R., & O'Dell, C. (2001). Overcoming cultural barrieres to sharing knowledge. *Journal of Knowledge Management , 5* (1), 76-85.

Okhuysen, G., & Eisenhardt, K. (2002). Integrating knowledge in groups: how formal interventions enable flexibility. *Organization Science, 13* (4), 370-386.

Papke-Sields, E., Beise, C., & Quan, J. (2010). Do project managers practice what they preach, and does it matter to project success? *International Journal Project Management, 28*, 650-662.

Petrović, D. (2012). Analiza procesa sticanja i trensfera projektnog znanja. *XVI Internacionalni simpozijum iz projektnog menadžmenta "U susret ekonomiji znjanja - upravljanje projektima znanja"*, 24-31. Zlatibor: YUPMA.

Prencipe, A. T. (2001). Inter-project learning: processes and outcomes of knowledge codification in project-based firms. *Research Policy, 30*, 1373-1394.

Reich, H. G., & Sauer, C. (2012). Knowledge management and project-based knowledge in it projects: A model and preliminary empirical results. *International Journal of Project Management , 30*, 663-674.

Sense, A. (2003b). A model of the politics of project leader learning. *International Journal of Project Management, 21*, 107-114.

Sense, A. (2007). Structuring the project environment for learning. *International Journal of Project Management, 25*, 405-412.

Shapiro, G. (1999). *Inter-Project Knowledge Capture and Transfer: An Overview of Definitions, Tools and Practices.* Complex Product System Innovation Center.

Swap, W., Leonard, D., Shields, M., & Abrams, L. (2001). Using mentoring and storytelling to transfer knowledge in the workplace. *Journal of Management Information Systems, 18* (1), 95-114.

Todorović, M. L., Petrović, D. Č., Mihić, M. M., Obradović, V. L., & Bushuyev, S. D. (2015). Project success analysis framework: A knowledge-based approach in project management. *International Journal of Project Management*,*33*(4), 772-783.

MATURITY MODEL COMPARATIVE ANALYSIS: OPM3 VS. IPMA DELTA MODEL

Dragan Bjelica*, Zorica Mitrović, Marija Todorović
Faculty of Organizational Sciences, University of Belgrade
*Corresponding author, e-mail: bjelicad@fon.bg.ac.rs

Abstract: *The purpose of the paper is reflected in the comparative analysis of the maturity models, specifically in relevant aspects of the IPMA Delta and OPM3 maturity model. The comparative analysis includes general and specific observation' characteristics from individual, project and organizational point of view. General characteristics include maturity model levels, maturity development, maturity assessment. Specific characteristics of each model are the essence of the model as well as what they clearly emphasize in maturity development – procedures, best practices, assessors' approach, etc. A maturity model assumed that progress according to goal and expected results' achievement comes in stages. Therefore, this analysis identifies potential issues for maturity implementation: "how to fulfill certain requirements", "how to quantify qualitative aspects of evaluation" and maturity model perceived as a "promotional tool". Theoretical and practical implications are discussed.*

Keywords*: maturity, assessment, project management, model, IPMA Delta, OPM3*

1. INTRODUCTION

In psychology, maturity has been perceived as a willingness to respond appropriately to external influences. This reaction is generally less instinctive. "Being mature" means to know how to behave in a given place and at the appropriate time in accordance with a specific circumstances and culture. Human being development theories include the purpose of life concept, which highlights the maturity of a clear purpose in life, direction and intention, which contributes that life has meaning. Maturity has different definitions across the legal, social, religious, political, emotional and intellectual context. According to the mentioned aspects, the concept and definition of maturity and immaturity, usually is explained very subjective.

Generally speaking, there are two main reasons for maturity models implementation in organizations. The first reason is reflected that suggested maturity model will help in verification process – comparing results with best practices in industry and categorization according to maturity level. The second reason for the maturity model implementation is an assessment of its current capabilities and goals to achieve the desired level. Organization gets an insight into their strengths and weaknesses and clearly observed actions and areas in which improvements are needed. In addition to the above, maturity model implementation also raises awareness in the context of possible improvements within the organization.

2. PROJECT MANAGEMENT MATURITY DEVELOPMENT

Maturity model development begins with the development of the first maturity model, known as maturity model based on the capabilities (Capability Maturity Model), created by the Institute for Software Engineering (Software Engineering Institute, SEI), with the support of the Ministry of Defense - United States. The model was developed and upgraded in the period from 1986 to 1997, and got his real successor in 2002, a model that is now known as Integrated model-based capabilities, (The Capability Maturity Model Integration, CMMI). Although primarily intended for the software industry has found its application in other business areas and serve as a basis for making the most famous models today.

Since the current stream of maturity analysis dedicated to the assessment of project management maturity is still in its early phases, there are many important aspects that remain unclear and, should be addressed by future research. Articles within scientific area maturity model development have the main objective of developing or creating a new maturity model. This may contain conceptual as well as design oriented models or descriptions of models, if the purpose is the introduction of a new model. Scientific articles within scientific area maturity model application aim principally at the maturity models' implementation in several

aspects or specific domains. They also include maturity appraisal and model implementation. Articles within scientific area maturity model validation have the main purpose of validating existing maturity models. This includes empirical as well as conceptual validation, maturity models comparisons, simulations, best practices, case studies, and so on. The main objective of articles within this topic area meta-articles is maturity models characteristics. These are, for instance, literature reviews, process models for the development of maturity models, or other theoretical perspectives (Wendler, 2012).

One important topic would be to assess and compare project management maturity in different strategic aspects for organization. Evaluation of maturity in project management company depends on the person carrying out the assessment and its ability to obtain important information about project management, as well as intelligent evaluation of data in order to show meaningful conclusions. In most situations, the auditors were hired consultants which are not connected with the organization, hired for their experience and expertise. This contributes to the impartiality and objectivity in the evaluation. Future research could analyze and compare project management maturity between organizations that largely rely upon internal projects, and organizations that generally contract for external project support. Future research could also analyze project management maturity in terms of the strategic importance of project management phases and activities. One of the most important aspects that future research should address is to emphasize a clear relationship between project management maturity and successful project delivery. The value of project management maturity assessments clearly establish this vital link (Grant & Pennypacker, 2006). The implementation of an adequate project success analysis can contribute to knowledge management in project environment (Todorović, Petrović, Mihić, Obradović, & Bushuyev, 2015).

Table 1: Overview of the maturity model

Model	**Organization**
Capability Maturity Model Integration – CMMI model	Carnegie Mellon University
Information Technology Capability Maturity Framework – IT CMF model	Innovation Value Institute
Portfolio, Programme and Project Management Maturity Model – P3M3 model	OGC i Axelos
IPMA Delta model	International Project Management Association - IPMA
Organizational Project Management Maturity Model – OPM3 model	Project Management Institute - PMI
COBIT Maturity Model	IT Governance Institute - ITGI
Project Maturity Model – PM^2 model	Interthink
PRINCE 2 Maturity Model - P2MM model	APMG International
Gartner Maturity Model for Project and Portfolio management	Gartner
Project Management Maturity Model – PMMM model	PM Solutions

3. PERFORMANCE EVALUATION AND MATURITY LEVELS

Performance evaluation and analysis of organizational maturity has become popular in the last decade, where the area of IT projects stand out as the primary area for the maturity model implementation. The concept of maturity for most people is associated with complete development. The same principle is applied in the project management context. There are different definitions in project management scientific field for project maturity. Different maturity concept analysis showed that the repeated project success and organizational strategic objectives are commonly associated with maturity in project management, and is generally perceived as:

- implementation of project management methodology and related processes, that they repeat with higher probability of success (Kerzner, 2001)

- the organization's ability to repeat the success in the successors' projects (Dooley, Subra, & Anderson, 2001)
- the overall ability of the organization to select and manage projects in a way that they support the organizational strategic objectives (Hermarij, 2013)

The basic concept of maturity models characterize the levels and the path of maturity. Each phase has a corresponding features, which include business improvements.

Table1: Maturity levels - characteristics

	Processes	**Documentation**	**Management**	**Metrics**
Level 1	There is no established practices and standards	There is no collected documentation – ad hoc approach	Management understands and is aware of the project management approach.	Collected informally on an ad hoc basis
Level 2	Processes exist, but there are not considered as organizational standards	Documentation exists only for the basic processes	Management supports the project management approach, but understanding and involvement is not consistently applied to all projects. Large projects are implemented in a systematic manner, and management is involved in such projects.	There are basic metrics to track costs, time, and technical specifications.
Level 3	All the project management processes are established as organizational standards. These processes include customers as part of the project team. Almost all projects using these standards.	Documentation exists for all projects.	Management is involved in key decisions related to the inputs and approvals.	Metrics formally collected and each project is evaluated and managed in the context of other projects.
Level 4	Processes, standards and systems support project management approach.	The processes are documented and support metrics' usage in the decision making process.	Management understands its role in the project management processes. There are different management styles and different project management requirements for various projects.	Effectiveness and efficiency are used as metrics. All projects, changes and issues are evaluated against the metrics of cost estimates, the planned assessment and calculation methods according to earned value.
Level 5	The established processes are actively used to improve project management activities.	Lessons learned are constantly reviewed and used to improve the standard processes and documentation in project management.	Management is focused on continuous improvement.	Metrics collected during the project implementation are used to analyze the project performance and to improve organizational decision-making process in the future.

The purpose of the maturity model implementation refers to the following aspects:

- Descriptive: Capability Maturity Model was created to describe the process whereby the current competencies of the organization evaluated according to preset criteria and therefore be used as a diagnostic tool. After organizational maturity assessment, it is necessary to inform internal and external stakeholders.
- Providing guidelines: Maturity models provide guidelines for performance improvements.
- Comparative aspects: Maturity paths are used for comparative purposes in order to provide benchmarking for internal and external stakeholders. The organization is compared with the prior therein based on historical data, then compared with industry norms and averages from the industry, competitors and set objectives in achieving the appropriate level of maturity.

4. IPMA DELTA MODEL

IPMA Delta model integrates the latest aspects of knowledge management and project management competences called "360^0 assessment of competencies". It was created by the International Project Management Association - IPMA. IPMA Delta model basically defines three aspects of observation and based on them integrate evaluation system: Individual level estimates (based on the IPMA Competence Baseline 3.0 - ICB), project level assessment (based on the IPMA Project Excellence Model) and organizational level estimates (based on IPMA Competence Baseline Organisational - OCB).

Certification system in organization provides confirmation that the organization has implemented a system with all relevant aspects and in accordance with company policy. Organizations based on an assessment of their position and status, can establish and ipmrove systems for project management. Top management decide about the organizational strategic directions and needs for improvement and therefore set goals for maturity improvements.

4.1. Individual level assessment

Individual certification level is based on an estimate of technical, behavioral and contextual competencies in project management. Each level of certification (A to D) carries the appropriate knowledge, skills and experience required. This system can be described as a "career focused on certification." Within three areas of competence there are 54 elements of competences (International Project Management Association, 2006).

4.2. Project level assessment

IPMA Project Excellence model (IPMA Project Excellence Model - PE) is modified for the purposes of self-evaluation for organizational projects and programs. It is based on the EFQM model (European Foundation of Quality Management) and principles of total quality management. IPMA Project Excellence model has been applied in many national and international associations for the reward system within the IPMA networks. This benchmarking tool has been used to measure project excellence. This model consists of segments that concern employees, resources, processes, leadership, project goals (Backlund, Chronéer, & Sundqvist, 2014).

4.3. Organizational level assessment

IPMA Organizational Competence Baseline defines organizational competence in project management, program and portfolio management. This standard defines organizational competences as the ability to integrate the people, resources, processes, structure and culture in projects, programs, and portfolio system. Organizational competence in project management should be specifically aligned with the mission, vision, organizational strategy, and should be focused in order to achieve results to ensure continuous organizational development. (International Project Management Association, 2013).

4.4. Delta effect

IPMA Delta model provides information based on the Delta, where the effect of competence ipmrovements show the maturity path to a higher class. Based on the analysis of individual, project and organizational competencies, the organization has insight into the strengths and weaknesses of competences for project management. The organization independently determines which category of competencies wants to certify. Also, the IPMA Delta shows the "delta effect" between existing and desired competencies in project management (International Project Management Association, 2014).

5. OPM3 MODEL

Model OPM3 (Organizational Project Management Maturity Model) is one of the most recognized standards in the world for assessing organizational maturity published by the Project Management Institute (PMI). The model was designed in 1998. He was preceded by the release PMI - Special Report of ethics, standards and accreditation, published in 1983, followed by PMBOK standards published in 1987 and the PMBOK Guide in 1996 and framework for development of project manager competencies OPM3 in 2002 (designed to translate the strategy into successful results - consistent and predictable).

Organizational Project Management presents systematic management of projects, programs and portfolios that are consistent with the strategic objectives of the organization. The concept of organizational project management is based on the idea that there is a correlation between the ability in the management of projects, programs and portfolios and its effectiveness in strategy implementing. The degree to which the organization implemented this system for project management called organizational maturity in project management.
OPM 3 was initially designed without an overall system related to the maturity levels. Establishing the specific maturity level would mean that the maturity analysis is one-dimensional. From the other hand, OPM3 is multidimensional. OPM3 also categorizes capabilities within the five process groups of project management (initiation, planning, implementation, control and closing) providing the possibility of evaluation through the four levels of maturity (Project Management Institute, 2003).

OPM3 standard has three key elements:

1. Knowledge - describes the organizational project management and organizational maturity in project management, explaining why they need it and how maturity in project management can be identified in the organization. PMBOK 5 is a key connection with maturity assessment.
2. Assessment - presents the methods, processes and procedures that an organization can use to realize self-assessment. Evaluation is done using the interactive tools of best practice that suggests further detailed consideration competencies required for project/program/portfolio implementation.
3. Improvement - provides processes, the skills' list they need to improve from lowest maturity level to higher levels of maturity.

6. COMPARATIVE ANALYSIS BETWEEN MODELS

Maturity models can be used as a short-term tool for assessing the maturity of enterprise, program or portfolio organization (currently determining the maturity) or as a long term asset for constantly improving the business processes of the organization or projects, programs and portfolios (continuous development process). One of the general characteristics, immanent to considered models, is that the assessment is determined on the basis of questionnaires and / or interviews. Usually it is pre-defined set of questions. The negative aspects for IPMA Delta and OPM3 model implementation are:

- Models describe "what it takes to be fulfilled in order to reach a certain level", but do not say anything about "how to fulfill certain requirements"
- There are not sufficient quantitative indicators for all aspect of maturity assessment
- The maturity assessment has been perceived as a "promotional tool"

Following table (Table 3.) characterize IPMA Delta model and OPM 3 model constraints and main components:

Table 3. Comparison between IPMA Delta model and OPM3 model constraints and components

Model	Constraints	Components
IPMA Delta	• Limitations on the quantification of maturity • Qualitative assessments of project and organizational components • Subjectivity of assessors (gives appropriate level of organizational maturity)	• Individual competence analysis (based on the IPMA Competence Baseline) • Project analysis of competences (based on EFQ model) • Organizational analysis of competences (based on IPMA Competence Baseline Organizational)
OPM3	• The framework should be accepted by top management • Highlighting the time, cost and less value being delivered • Insufficient emphasis on complexity, continuous learning, social processes, creating value, broad conceptualization	• Knowledge (organizational project management maturity and best practices based on the PMBOK processes • Evaluation (methods for the evaluation of best practices) • Improving (the order to develop the ability aggregating them into best practices)

7. CONCLUSION

Research shows that organizations have increased the level of maturity in project management with cost savings, increased ability to predict a time and schedule for the project and increase the level of quality. This implies that increasing maturity in project management positively affects the performance improvement in project. IPMA Delta defines five classes of organizational competencies in project management, emphasizing the current state of the organization with the areas where improvements are needed. Also, IPMA Delta Model is based on competences, while the OPM3 is based on knowledge and best practices. IPMA Delta and OPM3 model show the evolutionary trends in the project evaluation and appraisal, and create excellence aspects in project management field.

This paper is a result of the Project No. 179081 funded by Ministry of Education and Science of the Republic of Serbia: Researching Contemporary Tendencies of Strategic Management Using Specialized Management Disciplines in Function of Competitiveness of Serbian Economy.

REFERENCES

Backlund, F., Chronéer, D., & Sundqvist, E. (2014). Project Management Maturity Models – A Critical Review. *Procedia - Social and Behavioral Sciences*, *119*, 837–846. doi:10.1016/j.sbspro.2014.03.094

Dooley, K., Subra, A., & Anderson, J. (2001). Maturity and its impact on new product development project performance. *Research in Engineering Design*, *13*(1), 23–29. doi:10.1007/s001630100003

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.

doi:10.1109/TEM.2005.861802
Hermarij, J. (2013). *Better Practices of Project Management Based on IPMA Competences* (3rd editio.). Van Haren Publishing.
International Project Management Association. (2006). ICB - IPMA Competence Baseline. International Project Management Association.
International Project Management Association. (2013). IPMA OCB - IPMA Organisational Competence Baseline - The standard for moving organisations forward. International Project Management Association.
International Project Management Association. (2014). IPMA Delta Regulations and Guidelines. International Project Management Association.
Kerzner, H. (2001). *Strategic Planning for Project Management Using a Project Management Maturity Model*. Retrieved from https://books.google.rs/books/about/Strategic_Planning_for_Project_Managemen.html?id=ggujIuwubmYC&pgis=1
Project Management Institute. (2003). Organizational Project Management Maturity Model. Project Management Institute.
Todorović, M. L., Petrović, D. Č., Mihić, M. M., Obradović, V. L., & Bushuyev, S. D. (2015). Project success analysis framework: A knowledge-based approach in project management. *International Journal of Project Management*, *33*(4), 772–783. doi:10.1016/j.ijproman.2014.10.009
Wendler, R. (2012). The maturity of maturity model research: A systematic mapping study. *Information and Software Technology*, *54*(12), 1317–1339. doi:10.1016/j.infsof.2012.07.007

SUSTAINABILITY AND PROJECT MANAGEMENT – WHERE IS THE LINKAGE?

Danijela Toljaga-Nikolić*, Marija Todorović, Dragan Bjelica
Faculty of Organizational Sciences, University of Belgrade
*Corresponding author, e-mail: toljagad@fon.bg.ac.rs

Abstract: *The paper is aiming at providing the insight in one challenging issue that organizations and managers are facing with – linking sustainability with project management concept. Nowadays, managers attempting to integrate the concept of sustainability into organizational strategies, programs and projects, and it becomes a real challenge. How to embed environmental and societal issues in a way that project delivers expected outcomes? The paper presents different aspects of sustainability in a project management, including four-dimensional conceptual framework for managing sustainable projects. Since the traditional project management concept is mainly focused on time, budget and scope (regarding quality), now it becomes challenging how to consider equally and involve three aspects of the sustainability concept: social, environmental and economic aspects.*

Keywords*: sustainability, project, project sustainability, project management*

1. INTRODUCTION

Sustainability is a challenge for companies and managers today. This phenomenon is recognized as an organizational goal that companies integrate into their strategies, plans and actions. Managers are trying to include ideas of sustainability in different business areas, and project management is no exception. It could be said that every tendency to integrate sustainability into project management actually involves the entire project management process which indicates how complex this idea is. What is expected to happen as a consequence of sustainability concept integration into the project management process? Generally speaking, companies seek for increased market share and increased profits.

Today it is important to do business as a socially responsible company and, at the same time, companies are faced with growing clients and government demands. Under these circumstances, managers are searching for the best way to satisfy every stakeholder and responsibility for customers' needs satisfaction is also a quite important step. Sustainability in a project management can be seen as the project ability to maintain its operations, services and benefits during its life cycle (Khan, 2000). To meet sustainability goals, companies should be able to make sustainability as a required and measured part of project management process. By managing this process, added-value for all project stakeholders could be ensured.

2. LITERATURE REVIEW

Sustainability concept is analyzed globally and as a widely dispersed one (Lozano et al., 2015). UN World Commission on Environment and Development defined sustainability as "a form of progress that meets the needs of the present without compromising the ability of future generations to meet their needs" (UN World Commission on Environment and Development, 1987). According to this definition, an element of sustainability is the aspect of future orientation and concern for future implications. Also, the same report includes statements of both social and environmental perspectives, and states that "in its broadest sense, sustainable development strategy aims at promoting harmony among human beings and between humanity and nature".

(Silvius & Schipper, 2014) completed a structured review of 164 books, book chapters and papers, and identified areas of impact which provide base for project sustainability consideration, e.g. project stakeholder management, project risk management, project portfolio management, etc. The authors concluded there are a growing number of publications that relate sustainability to project management. The importance of this burning issue is recognized by leading professionals and researchers in the project management field as well. The relationship between sustainability and project management is considered as one of the important developments in project management (Labuschagne & Brent, 2006). At the 22nd IPMA World Congress in 2008, IPMA Vice-President Mary McKinlay stated in the opening keynote speech that "the further development of the project management profession requires project managers to take responsibility for

sustainability". It indicates the importance of taking responsibility for the project results which includes the sustainability aspects of that results.

Definition of project management suggested by the Project Management Institute is widely accepted and, it refers to applying knowledge, skills, tools and techniques to project activities to meet the project requirements (Project Management Institute, 2008). Since sustainability includes multi-dimensional perspectives, such as economics, social and environmental aspects, sustainability should be included in all these aspects of project management (Marcelino-Sadaba et al., 2015).

Project deliverables can have social, economic and environmental impacts with longer lasting than projects themselves (Sanchez, 2015). Aligning portfolio selection and monitoring with the principles of sustainable development requires procedure (selection based on project cost and contribution to organizational goals). According to (Fernandez-Sanchez et al., 2010), a project is sustainable when three dimensions of sustainable development are improved, maintaining time, cost, quality and effort within an acceptable range. The sustainability principles are reflected in the definition or perception of project success. There is a strong link between sustainability in project management and project success. Todorović et al. (2014) stated about importance of measuring and analysing the project success, where success factors must be transferred to the operational level and become measurable.

Boswell et al. (2005) stated that it is difficult to achieve conditions for sustainable development and also not so easy to demonstrate that achievement. To achieve strategic sustainability objectives, project managers have to transform them into specific actions for projects. The necessity to move project management from the traditional approach toward a sustainable management is marked as a challenge and managing projects often requires dealing with organization factor that is sometimes beyond project manager`s control. Also, it is important to ensure that an organization is implementing projects that will reach stakeholders demands and its strategic goals by resolving portfolio selection problem. (Sanchez, 2015) recommends project portfolio selection based on the eco-impacts simultaneous analysis and analysis of the contribution to organizational goals.

An important phase in involving sustainable issues into project management is a clear understanding of the project life cycle and its phases (Sanchez, 2015). Different life cycles involved in a project interact mutually. Project life cycle is the life cycle where an idea is generated, developed and implemented. Asset/Process life cycle includes design, development, construction, implementation and removal of the service. And product life cycle recognizes the project deliverable as an idea that generates income for the company (Labuschagne et al., 2005) (Labuschagne & Brent, 2008). If we consider sustainability involvement in project management, then project life cycle should be taken into account (Labuschagne & Brent, 2006).

Maletic et al. (2014) pointed out that project management standards define several important management areas (products/services, stakeholders, processes) and they are, at the same time, aspects required for sustainable management. That makes project management as a good path for introducing sustainability in an organization (Bocken et al., 2014). Involving sustainability within strategic goals requires introducing innovation and learning from experience. Innovation can be considered as an important step for both business success and connect sustainability with project management (Amini & Bienstock, 2014).

3. DIFFERENT ASPECTS OF SUSTAINABILITY IN A PROJECT MANAGEMENT

The way of how society today is living, producing, consuming, etc. indicates that it might have negative effects on the life of future generations. This is why society today concerns about sustainability more than ever in every possible aspect. The traditional way of doing business cannot be called sustainable. Therefore, managers in organizations think about changes. The linkage between sustainability and project was established in 1987 by UN World Commission on Environment and Development, but today it could be said that sustainable society is seeking for projects since many changes in organizations are organized as projects (Sivius et al., 2012).

Based on the sustainability concepts, (Silvius et al., 2012) developed a working definition of sustainable project management: "Sustainable project management is the management of project-organized change in policies, assets or organizations, with consideration of the economic, social and environmental impact of the project, its result and its effect, for now, and future generations". The authors proposed project management processes, performance indicators, and competencies as areas in which project management has to develop in the future to capture the influence of sustainability.

Projects have an important role in the implementation of sustainable business processes and practices in organizations and therefore, project managers have a strong impact on the sustainability of organizations. According to (Silvius & Schipper, 2014), the project management standards failed to indicate the importance of the project managers' role in implementing sustainable development, and there is a certain competence gap of project managers concerning sustainability. To successfully introduce sustainability in organizations, (Silvius & Schipper, 2014) stated how crucial is to close this competence gap by the standards of project management competencies. The authors put the focus on five key-competences for sustainability: systems thinking competences, anticipatory competences, normative competences, strategic competences and interpersonal competences. By recognizing the importance of these competences, project managers will be well prepared for their crucial role in realizing sustainability of organizations.

According to Silvius and Schipper (2014), there are several differences in the characteristics of sustainable development and project management concepts.

Table 1: The differences between a sustainable development and a project management concepts

Sustainable development	Project management
Long term + short term oriented	Short term oriented
In the interest of this generation and future generations	In the interest of Sponsor / Stakeholders
Life-cycle oriented	Deliverable/result oriented
People, Planet, Profit	Scope, Time, Budget
Increasing complexity	Reduced complexity

The traditional concept of projects management and the concept of sustainable project management might be somehow in contrast. This is because in traditional concept, managers concern for time, budget and scopes (regarding quality), while now there are three elements that should be considered carefully: social, environmental and economic aspects (Daneshpour, 2015). (Marcelino-Sadaba et al., 2015) proposed a new conceptual framework that helps project managers in dealing with sustainability in projects (Figure 1). This framework is based on the assumption that following four dimensions are crucial for accomplishing sustainable project: *products* designed by using sustainability criteria, sustainable project *processes*, *organizations* committed to sustainability that carry out projects and *project managers* trained in sustainability.

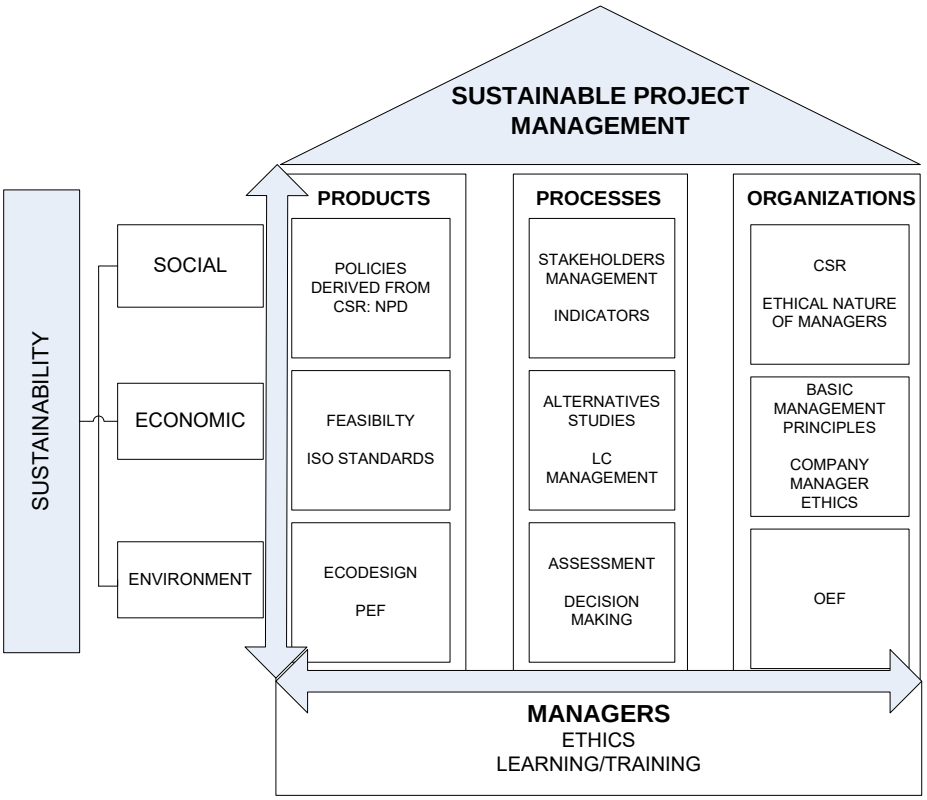

Figure 1: Four-dimensional conceptual framework for managing sustainable projects (adapted from (Marcelino-Sadaba et al., 2015)**)**

Figure 1. represents the conceptual model of the four dimensions of the sustainable project. Each dimension (products, processes, organization and managers) includes principles related to the three pillars of sustainability: social, economic and environment. The first dimension put focus on sustainable project products and the second one on the processes that help to include sustainability in the project. The third dimension relates to organizations that managing projects committed to sustainability and the fourth refers to project managers who are actually key players in linking sustainability and project management (Marcelino-Sadaba et al., 2015).

4. DIMENSIONS OF PROJECT SUSTAINABILITY

Project managers are seeking for ideas on how to make their projects more sustainable. Different authors, (Schieg, 2009) and (Goedknegt, 2012), pointed out that project managers have to take responsibility for sustainability. (Russel, 2008) stated that project manager`s position is excellent to influence operations within the organization to obtain greater sustainability. To include sustainability considerations in project management, project managers need to know dimensions of project sustainability. By knowing that, project managers increase the chances of project success. These dimensions have the potential to influence project sustainability and therefore has to be considered to ensure project sustainability. If any of these dimensions shows weakness, the sustainability of the entire project might be ruined. Dimensions of project sustainability are:

- Logistics dimension
- Economic dimension
- Community dimension
- Equity dimension
- Institutional dimension
- Environmental dimension (Khan, 2000)

Logistics dimension refers to the continued operation and the maintenance of project facilities. The question that can be asked is as following: Has the project received necessary support (both budgetary and institutional) to enable it to maintain required level of facilities?

Economic dimension refers to the continued flow of net benefits (for economic sector projects). Questions that can be asked are as following: Has all the cost and benefits under varying conditions weighted properly and does the project guarantee an acceptable level of financial and economic return?

Community dimension refers to the continued community participation (in projects where active community participation is crucial for both fostering new actions as well as for cost recovery). Questions that can be asked are as following: Has the project involved the community? Has it succeeded in maintaining a desirable level of participation of the community in the project activities?

Equity dimension refers to the equitable sharing and the distribution of project benefits. Questions that can be asked are as following: Has the project incorporated mechanisms that guarantee equitable access to and distribution of project benefits on a continuous basis?

Institutional dimension refers to the institutional stability. Questions that can be asked are as following: Has the project considered the institutional requirements and thus made provisions so that management support to project operations continue, during the life of the project?

Environmental dimension refers to the maintenance of environmental stability. Questions that can be asked are as following: Has the project considered environmental implications so that negative impacts on the environment are either avoided or mitigated during the life of the project? (Khan, 2000)

5. CONCLUSION

Sustainability and project management are two disciplines that are closely linked. Nowadays, organizations are searching for the more sustainable approach on project management. Organizations need change, and that change is organized in projects because these projects are likely to make a contribution to the organization sustainable development. To meet sustainability goals, managers should be able to make sustainability as a required and measured part of project management process. And, in order to define, implement and measure sustainability in the project, project managers should establish project management processes and procedures that could help in meeting sustainability goals. Also, project life cycle should be taken into account as a cycle where an idea is generated, developed and implemented.

The concept of project sustainability includes several dimensions that managers need to know to increase the chances of project success. Four-dimensional conceptual framework for managing sustainable projects can be used as a model where each dimension: products, processes, organization, and managers, includes principles related to the three pillars of sustainability: social, economic and environment. Still, there is a lot of effort that has to be involved in implementation of the sustainability concept in the management of projects.

Acknowledgments

This paper is the result of the project of basic research “Exploring modern trends of strategic management of the application of specialized management disciplines in the function of the competitiveness of Serbian economy”, no. 179081, funded by Ministry of education, science and technological development of the Republic of Serbia.

REFERENCES

UN World Commission on Environment and Development. (1987). *Our Common Future.* Great Britain: Oxford University Press.

Amini, M., Bienstock, C. (2014). Corporate sustainability: an integrative definition and framework to evaluate corporate practice and guide academic research. *Journal of Cleaner Production, 76*, 12-19.

Bocken, N.M.P., Short, S.W., Rana, P., Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production, 65*, 42-56.

Boswell, J., Wallace, B., Boswell, P. (2005). Project sustainability management: translating words into action. *Civil engineering: Magazine of the south African institution, 13*(8), 12-15.

Fernandez-Sanchez, G., Rodriguez-Lopez, F. (2010). A methodology to identify sustainability indicators in construction project management - application to infrastructure projects in Spain. *Ecological Indicators, 10*, 1193-1201.

Goedknegt, D. a. (2012). The Implementation of Sustainability Principles in Project Management. *Proceedings of the 26th IPMA World Congress*, 875-882. Crete: IPMA.

Hosein Daneshpour. (2015). Integrating Sustainability into Management of Project. *International Journal of Environmental Science and Development, 6*(4), 321-325. doi:DOI: 10.7763/IJESD.2015.V6.611

Khan, M.A. (2000). *Planning for and monitoring of project sustainability: a guideline on concepts, issues and tools.* UNDP.

Labuschagne, C., Brent, A.C. (2006). Social indicators for sustainable project and technology life cycle management in the process industry. *International Journal of Life Cycle Assessment, 11*(1), 3-15.

Labuschagne, C., Brent, A.C. (2008). An industry perspective of the completeness and relevance of a social assessment framework for project and technology management in the manufacturing sector. *Journal of Cleaner Production, 16*, 253-262.

Labuschagne, C., Brent, A.C., van Erck, R.P.G. (2005). Assessing the sustainability performances of industries. *Journal of Cleaner Production, 13*, 373-385.

Lozano, R., Carpenter, A., Huisingh, D. (2015). A review of "theories of the firm" and their contributions to corporate sustainability. *Journal of Cleaner Production*, 430-442. doi:doi:10.1016/j.jclepro.2014.05.007

Maletic, M., Maletic, D., Dahlgaard, J., Dahlgaard-Park, S., Gomiscek, B. (2014). Sustainability exploration and sustainability exploitation: from a literature review towards a conceptual framework. *Journal of Cleaner Production, 79*, 182-194. doi:http://dx.doi.org/10.1016/j.jclepro.2014.05.045

Marcelino-Sadaba, A., Gonzalez-Jaen, L.F., Perez-Ezcurdia, A. (2015). Using project management as a way to sustainability. From a comprehensive review to a framework definition. *Journal of Cleaner Production, 99*, 1-16. doi:http://dx.doi.org/10.1016/j.jclepro.2015.03.020

Marisa Analia Sanchez. (2015). Integrating sustainability issues into project management. *Journal of Cleaner Production, 96*, 319-330. doi:http://dx.doi.org/10.1016/j.jclepro.2013.12.087

Project Management Institute. (2008). *A Guide to the Project Management Body of Knowledge (PMBOK Guide), fourth ed.* Newtown Square, PA: Project Management Institute.

Russel, J. (2008). Corporate Social Responsibility: What It Means for the Project Manager. *PMI Global Congress EMEA.* Malta: PMI.

Sara Marcelino-Sadaba, Luis Felipe Gonzalez-Jaen, Amaya Perez-Ezcurdia. (2015). Using project management as a way to sustainability. From a comprehensive review to a framework definition. *Journal of Cleaner Production, 99*, 1-16. doi:http://dx.doi.org/10.1016/j.jclepro.2015.03.020

Schieg, M. (2009). The Model of Corporate Social Responsibility in Project Management. *Business: Theory & Practice, 10*, 315-321.

Silvius A.J.G., Schipper, R.P.J. (2014). Sustainability in Project Management Competencies: Analyzing the Competence Gap of Project Managers. *Journal of Human Resource and Sustainability Studies, 2*, 40-58. doi:http://dx.doi.org/10.4236/jhrss.2014.22005

Silvius, A. S. (2014). Sustainability in project management: a literature review and impact analysis. *Social Business, 4*(1), 63-96.

Silvius, A.J.G., van den Brink, J., Kohler, A. (2012). The impact of sustainability on project management. In H. Linger, & J. Owner (Eds.), *The Project as a Social System - Asia-Pacific Perspectives on Project Management* (p. 300). Monash University Publishing.

Todorović, M., Toljaga-Nikolić, D., Mitrović, Z. (2014). Project Success Analysis: Evidence from Serbia. *"New Business Models and Sustainable Competitiveness" SYMORG 2014*, 1429-1435. Zlatibor, Serbia: Faculty of Organizational Sciences.