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ORIGINAL ARTICLE

Efficient Managing of Complex Programs with Project Management Services

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Abstract *In the following work, we analyse complex project management processes and propose understanding of project management tools as a service, both when speaking in software terms and management skills frames. Project management can be offered as a service in different forms. Companies specialized in project management may manage a project for the benefits of third party, using the client's technical knowledge and principles of work. Companies that want to manage their projects internally need project management training service and software solution with certain functionalities and characteristics. The solution must follow the company policies in regard to resources, time and cost management, collaboration etc. Due to companies' specifics, it is highly unlikely that an off-the-shelf solution is applicable everywhere. The service of customization of an existing tool or development of a system specifically for the company needs can be also considered a project management service.*

Keywords Collaboration · Flexible complexity management · Project management · Project phases · Project triangle · Service

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Introduction

The concept of a project is close to all of us, and has been around for longer time. Everyone can think of a one-time activity with a clearly defined output that should be performed within a certain period of time. Examples include getting a university degree, building a hydro power plant, implementing software in an organization etc. Morris et al. (2010) place the formal appearance of project management in 1950, when the US Air Force used the discipline for efficient management of engineering and production of complex programs. Regardless of the form in which it is used, the authors recognize that project management plays a central role in delivering innovations. Somasundaram and Badiru (1992) state that an effective usage of project management techniques brings success in qualitative improvements of products and services. Due to the project vast applicability, we understand the importance of knowing and using certain project management techniques and processes that enable the achievement of the defined project goals in efficient (on time, within the defined budget) and effective (appropriate realization of the planned objectives) manner.

Knowledge of the applicable processes and specifics of the project phases are essential for successful project management. People are an important asset in the project organization because they have a defined responsibility for performing certain work packages and activities within time and budget. The project team and project stakeholders hold an important set of knowledge that can be applied to the current project and further transferred to future ones. That is why we find meaningful to elaborate the collaboration aspect in project management and the requirements for its successful fulfilment.

We identify the high involvement of the user of a project management tool in the system's creation and

customization process to comply one of the foundational premises of service–dominant logic. Vargo and Lusch (2008) argue that the high involvement of the receiver of a service makes him co-creator of the value. The customer is then defined as a co-producer. The interactive and network effect of service is included in the premises of service dominant logic (Wang et al. 2010). The role and the efforts of a receiver of a certain project management solution are quite similar. The software solution must comply with the receiver's procedures and guidelines and that is why it requires the user's contribution in the creation process. Based on that, and on further project management characteristics described below, we see the provider of a project management software tool as a provider of service. The price of a customizable project management solution is negotiated between the parties and cannot be defined on a general basis that would be applicable for all clients. The value of that service is defined in mutual cooperation. The provider cannot predefine it, as at the beginning he might not be aware of the scope of the tool and the requirements of the user. That complies with the explanation of Wang et al. (2010) that the good–dominant logic has the product in focus. Its value is defined in the product creation process and then just further passed from the producing company to a non-involved consumer for a certain price, whereas the service–dominant logic sees the product only as a distribution mechanism and assumes closer communication between the producer and consumer. The project management electronic system created and given on disposal to a company by another party can be defined as a service, as it is a non-physical good since its functionalities are what actually matters. Based on that, according to the acts-based and ownership-based service definitions summarized by Kayastha (2011), it can represent a service. The system might be connected with certain physical product as a means for delivering the service, but that is again foreseen in the service dominant logic mentioned above. Lovelock et al. (1996) define service to be an act or type of performance, which one party offers to another. The authors also recognize that the process might be connected with a certain physical product, but they focus on the characteristics of the performance. The performance itself is actually intangible. We recognize the delivery of updates of the system and the performance of change requests due to changed customer's processes or internal project management guidelines as a service, as well. This idea is in line with the concept of Turner et al. (2003) that assumes that the software market operates driven by demand.

Project management can be analysed as a service from different points of view. Other situation in which we recognize it as such is when an organization specialized in project execution offers its services to another company and manages its projects for the customer's benefit. Justification for this idea can be found in the definition of service of Vargo and Lusch (2004, 2006)—"the application of competences (knowledge and skills) by one entity for the benefit of another" (as cited in Vargo et al. 2008). Blindenbach-Driessen and Van Den Ende (2010) argue that the importance of the project-based companies is growing with the increasing demand for complex systems and knowledge-intensive services. In a comparable context, Rosemann (2010) recognize the task of managing project as a provision of service and state that the project management as a service has high impact on business process management and process design services. The provision of project management trainings is a widespread service these days, as well.

Further on, we propose recognition of the benefits project management offers to other services as an additional type of service. For example, it has been proven that good project management has a positive influence on cost reduction and quality improvement of health care services (Sa Couto 2008). Project communication within the team and toward the stakeholders moderates the innovation process and decreases the uncertainty of the success of financial services' innovations (Lievens and Moenaert 2000). We see project management as a service that gives benefit to the receiver that can be further passed on.

Why do we focus on project management as a service? The increasing interests in project management arises with, on one side, the recognition of it as separate type of management process that deals with certain change in the organization and focuses on defining, planning, executing and monitoring activities with considerable confidence, and, on the other side, with the fast and dynamic development of the software industry (Lockyer and Gordon 1996). Lee-Kelley et al. (2003) also recognize the new role of project management as a core process in the organizations and claim that this changed positioning of project management is a consequence of the fast market and technological development as well as increased focus on specialization and expertise. The pressure for new products and services, the increased quality, changing technology and tough competition intensify the need for executing different types of unique, temporary activities managed in the right way (Verzuh 2005). The project management discipline has increased its applicability in the different spheres of the companies and has evolved to a separate business process that has an impact on every functional area and it is a prerequisite for successful survival of the company (Kerzner 2009). The pace of change opens possibilities for application of project management in different service forms.

The first perspective of Lockyer and Gordon (1996) offers the possibility for outsourcing of the project management process and receiving it as a service. Their second

perspective gives introduction to the electronic project management platforms: system requirements and existing solutions. Due to the increased applicability, the project management tools are in the focus of our research. The project management systems enable proper implementation of the company project methodology and are provided in a customized form by a third party. Because the idea behind our approach is that those systems are delivered as a service to another company, we will take a closer look on how they are built and what type of rules and processes must be considered.

The basic conceptualization of project management in "Project Management Conceptualization" section serves as an introduction for further recognition of the major criteria that a project management software tool should fulfil in order to support the project management activities in a company. Understanding and identifying some of the different requirements and business needs based on which the systems are chosen or developed is the purpose of "Project Management Systems to Support Complex Programs" section. Only in that way a good service can be provided. The interdependence of project, program and portfolio management finds its place in that section as well. One of the industries in which the project management tools find vast application is the construction industry. The complex requirements of the solutions used there are discussed.

The companies employ different types of systems for support of the specific company processes. The interaction possibilities and the positioning of the project management platform in this type of environment are also important. In order to identify the broader picture, the relationship between project management and business intelligence (BI) can be further explored. As we understand it, business intelligence is interested in successful project management implementation within an organization not as a separate activity for each project, but as a possibility for sharing information and collaboration within the whole company. That in turn leads to resources and knowledge optimization and enables informed decision-making process (Stoshikj et al. 2013).

Project Management Conceptualization

In order to understand the task of project management, we need to know the elements of the project itself. Project Management Body of Knowledge (hereafter "PMBOK") defines project as "*temporary endeavor undertaken to create a unique product, service, or result*" (PMBOK 2008). It is a unique, complex set of tasks with defined duration which is further broken down into phases, working packages and subtasks that require scope, time and budget planning, coordination and control. The responsibility for the execution and monitoring of the project working packages is assigned to the team members. That requires good established project management team and clearly defined project management goals. Project management finds its application in different industries and business spheres, ranging from its start in military, construction, followed by the usage in the service industry, software development industry, etc. Its underlying principles are everywhere valid (Meredith and Mantel 2011). Project management information systems are software tools that support the management in the project execution. Due to their information, calculation, collaboration and storage functionalities, they are suitable for implementation of complex projects (Braglia and Frosolini 2014).

Munns and Bjeirmi (1996) make a clear distinction between the concepts of project and project management. Project refers to achievement of a certain objective through different tasks and activities, whereas project management is the process that actually controls the achievement of those defined objectives. Project Management Institute (PMI), not-for-profit membership association for project management, defines it as "*the application of knowledge, skills and techniques to execute projects effectively and efficiently*" (Project Management Institute Inc. 2013). This institute is the publisher of PMBOK. PMBOK explains the management processes within project management, such as quality management, time management, cost management, risk management, communication management, HR management, procurement management and project integration, and states its importance as strategic competitive advantage of the company. Hall (2012) states 1,000 % increase in the memberships in PMI within 15 years as an indicator of the project management emergent growth. This at the same time is a challenge for further development of project management techniques. Project management has established itself as a universal set of techniques, which finds applicability in any type of activity in any sector (Hodgson 2002). Sommer (2010) argue that nevertheless if the project management is internally performed, or assigned to external service providers, it has to manage the various tasks in a comprehensive manner.

In its PMBOK Guide PMI defines five major project management process groups, in which 42 logically grouped processes find their place (Kerzner 2009):

- Project initiation: the purpose and the benefits of the project are identified; project manager is assigned; documentation is prepared.
- Project planning: scope, work requirements, quality and quantity of work, activity schedule and resources are defined, risk analysis is performed.
- Project execution: performance and team management.
- Project monitoring and controlling: progress check, gap analysis and corrective action.

- Project closure: check if all scheduled work is done; contractual, financial, and administrative closure.

The project process groups are not the project phases. The processes are to be repeated within each project phase when dealing with complex projects (PMBOK 2008). Figure 1 shows the interrelation of the process groups within the project boundaries.

The four project phases are conception (idea initiation), development (detailed project plan), realization and termination (Lockyer and Gordon 1996). Figure 2 presents the PMBOK view on the project life cycle, with additional information on the involved costs and staffing level.

The major task of project management is to balance between the project constraints that are present in terms of scope, budget, schedule, resources and quality. The activities within the phases are executed in a way to manage the dedicated resources within time, cost and for satisfactory performance. That constitutes the project management cost-schedule-quality triangle that has to be carefully managed in a way to enable project goal achievement without exceeding in any of the segments, as that would have negative impact on the related two. Figure 3 shows the dependency of the elements in the project management triangle (PMBOK 2008).

Lee-Kelley et al. (2003) support the extended approach of Turner (1999) that not only the triangle, but all project

Fig. 3 An overview of project management triangle (Kerzner 2009, p. 6)

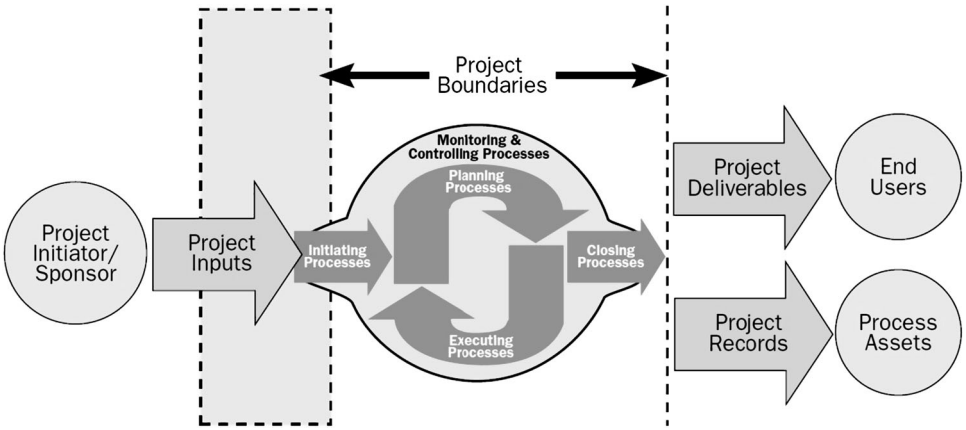

Fig. 1 Project management processes within the project boundaries (PMBOK 2008, p. 44)

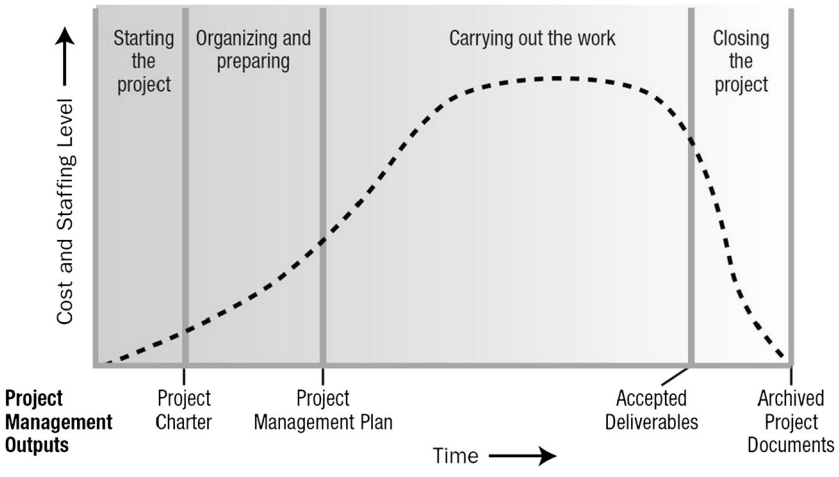

Fig. 2 Typical cost and staffing levels across the project life cycle (PMBOK 2008, p. 16)

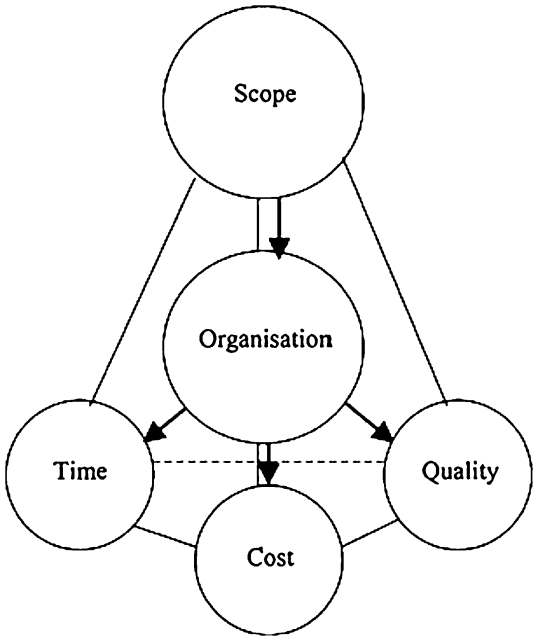

Fig. 4 Turner's five-functions of project-based management (1999:8) (Lee-Kelley et al. 2003, p. 584)

management objectives must be managed: the project definition and scope, the project organization as well as the time, quality and cost (as shown in Fig. 4). The first two are derived from the needs of the customer and have an influence on the three constraints in the triangle. The scope and project organization are to be clearly defined with the receiver of the project management service. They make each project unique. Uniqueness deriving from the customer's involvement is a characteristic of a service.

We shortly mention the important planning elements of the project management in this section, so that the practical usage and with it, service offered by such a system is clear. At the beginning of the project, the detailed project plan that defines and integrates all activities has to be documented and more importantly, understood and accepted by the whole project team, as the one represents a primary source of information throughout the project. At the very beginning of managing a project the needs and expectations of all stakeholders have to be considered and appropriately included in the planned execution (PMBOK 2008). Work Breakdown Structure (WBS) has to be further created. The WBS is a planning tool for the projects execution. It is kind of a project task list that hierarchically structures the work required within the project scope. The project deliverables are separated and presented in detailed logical order. WBS can be presented in either graphic or outline form (Verzuh 2005). Its representation is dependent on the possibilities of the software tool.

The activities and actions needed to produce the project deliverables after identification should be logically connected. As the planning enters in details at that stage, the associated resources needed for the performance of the actions are assigned, along with the estimated activity duration. In that way, the detailed project schedule is done, and the cost estimates as basis for the budget can be calculated. For easier controllability and up-to-date status on the project progress, milestones that represent certain time point, an event, are defined and their execution is followed. Milestones are actually activities with zero duration. As an input from the scheduling, the human resource plan can be derived and optimized. Risk management should be included during the planning phase, so that the possible impacts could be estimated and included in the initial plan (PMBOK 2008).

The execution of the planned activities is reviewed and controlled within the monitoring and controlling process groups and that requires implementation of certain calculating and tracking features. The project management tools support the performance of these activities and help in the plan calculation and optimization. The outputs of the systems in terms of different plans (activity plan, time plan, budget plan, HR plan, etc.) are dependent on the system characteristics and possibilities as well as the customer needs. The above-explained planning actions impose requirements that should be met by the system (Stoshikj et al. 2013).

We shortly introduce the involved parties and their different interests in a project, so that the communication aspect is considered. That sets some general guidelines for the collaborative features that a project management tool should have. The size and type of the expected communication are also setting some general requirements for the type of the software, the chosen platform and the environment in which it is to be developed and implemented. The specifics are further dependent on the client's needs.

There are different roles that are included in the project management process. The PMBOK provides certain information on their characteristics and involvement in the project. The role of the project manager as a supervisor of the whole process has highest involvement with the project management system and highest frequency of communication with the other roles. He is the link between the project sponsor and the project team. The team members are the specialists in their field that perform the work according to the work packages plan. It is decisive that there are given certain responsibility and included in the whole communication throughout the project. The company management is an important stakeholder whose opinion and approval must always be asked for. The project owner/sponsor has direct interest in the project performance, which is why he is ultimate responsible for setting the project boundaries. He might be part of another organization that uses the project management service of a

specialized company, as well. The project owner is actually the client, and, as Thompson (1991) states, his role is crucial. Stakeholders are all people or organizations, which are somehow affected by or affecting the project. They can be internal or external, as sponsors, media, customers, departments, and can have positive or negative influence on the project. It is crucial that their requirements are derived at the beginning of the project and communicated properly. In case there are many stakeholders involved, the ones can be classified by their similarity, and approached with different communication strategies. Communication management is one of the knowledge bases of project management. It "*includes the processes required to ensure timely and appropriate generation, collection, distribution, storage, retrieval, and ultimate disposition of project information*" (PMBOK 2008). The diverse social and cultural background, level of experience and project involvement of the different persons represent significant challenges for effective communication. That is why a separate well thought-through communication plan, where the inputs, tools and techniques and defined outputs are stated, has to be developed. Looking from the group process perspective, information distribution and team management are two major processes that are taking place within the execution of project process group. The closure processes also involve need for written and oral communication within and out of the team (PMBOK 2008).

The communication process is mostly executed by the project manager, who has to clearly transfer his plans and thoughts to the team and actively receive feedback from their side. He has to be able to express himself written and oral in clear way, leading meetings and resolving potential conflicts effectively. It is very important that the information is communicated clearly so that the tasks can be also executed in the right way. The four major communication needs within the project team are the need each to know exactly what he is responsible of, coordination, project status and need for authorization—knowledge of all stakeholders' decisions affecting the project. The communication with the customers asks for different features as well (Verzuh 2005). The importance of an effective communication is not to be underestimated, as improper communication may cause delay in the project plan, or lead to misunderstanding with and dissatisfaction by important stakeholder groups. The project communication can be classified on basis of different characteristics. Depending on whether is executed within the project or externally towards the customers or the media, it can be defined as internal or external. Depending on the direction, it can be vertical (flow upwards and downwards within the organization) or horizontal (among colleagues on same level, peers). In terms of the formality, it can be formal, through reports and briefings, or executed on more informal level, through emails and open discussions. Connected with that is the division on official and unofficial communication. Further on, it can written or oral, and within the second one, verbal or non-verbal (PMBOK 2008). The classifications point out the different requirements and infrastructure needed for performing each of the named communication types.

This brings us to the communication technology that will be implemented for enabling collaboration within the project. There are different methods that can be used for information sharing and collaboration among the project stakeholders, in terms of the used features and communication channels. Selection of the appropriate ones is to be made based on the client requirements that are analysed at the project beginning. The type of collaboration expected to take place within the project can be also estimated based on the client's organization, culture, history and previous projects. Certain features can be derived from the information urgency—whether frequently update of information should be supported, if collaboration is to be encouraged, the number of communication directions, etc. The distribution tools and techniques are to be chosen based on this type of analysis. All of the involved aspects have to be carefully analysed, as communication has been perceived to be one of the biggest reasons for success or project failure (PMBOK 2008). It is interesting to analyse when a project is considered success or failure. Savolainen et al. (2012) define the customer satisfaction, short-term and long-term business benefits as measures for software development project success, but name no specific definition for project failure.

The social interactions and network relationships between people working on temporary projects in a project based organization, interacting in and out of the project structure is of high importance for the project success, as it has been empirically proven that the cohesion of the interactions and the diversity of the people included within the social networks affect proportionally the project performance and outcomes. The importance of inter-project coordination and the importance of transfer of explicit and tacit knowledge held and shared by the people for further projects success, decrease of redundancies and coordination within the organization point out the need for software support of a collaborative network (Vincenzo and Mascia 2012; Engelhardt-Nowitzki et al. 2001).

Project Management Systems to Support Complex Programs

The software systems are developed to support the operative and strategic business conduction and to provide the manager with current status and summarized data, based on which he will be able to make informed decisions. Their

creation arises from the need to have an electronic, reliable system in which human's inconsistent approaches, limited calculating, storage and modelling capacity, as well as certain errors could be avoided, and which will support the performance of complex activities. At the same time, the progress and results of the activities can be easily communicated through the system to all involved parties, and can also serve as an input or knowledge-base for the performance of consequent or similar activities (Auer et al. 2011; Kryvinska et al. 2011).

Generally said, this is basically the purpose of the project management software solutions. They are developed in a way to support the project manager throughout the project management processes, shortly described above, into his planning and controlling activities within complex projects, and at the same time involve the project management (core) team in certain aspects. For the extended circle of members, stakeholders involved in the project, the tool can be seen as a communication platform, providing up-to-date information, and enabling collaboration within the team, as for example, the responsible for certain working packages can insert information on the current progress, resources needed for the next activities, arisen changes in the plan etc.

NASA Project management tool analysis and recommendations white paper states that "*the Project Management tools are used at every project level to organize tasks and track project status, allocate responsibilities, and plan and track project costs and resources*" (NASA White Paper 2001). First question that comes into the mind when recognizing a need for a project management software tool is whether to have it developed from scratch or buy an existing, commercial one that would be customized to suit the specific needs. The current offer on the market and the development/customization costs of a service company are decisive for the decision.

We mention some of the important requirements of a project management tool that should be paid attention to. Their applicability and level of sophistication represent evaluation and selection criteria. Our idea behind is that the project management solutions might be quite different from each other and that opens market for consultancy and customization as a service. Being acquainted to the different roles and responsibilities in the project management organization, it can be easily understood that the project management requirements differ between the different users. The number and type of users and the way their cooperation is performed (place and time) should be known, so that the system capacity for maximum concurrent users and different user type's configurations is estimated (Microsoft 2012a, b, c). They may also be (technical) constraints posed from the external environment and the place and time of team collaboration, which is why it is very important that all of these aspects are considered when deciding which project management tool to implement for usage in the project organization. Choosing the right tool has direct impact on the project communication and final success, which is why, as for any other software tool, nevertheless if for development or purchase and customization, right identification of the system, functional, non-functional requirements as well as the business rules has a decisive role for further efficient and effective usage of the tool (Japenga 2013). Although it is a challenging phase at the beginning of the project itself, the right understanding of the business needs is essential (NYS project management guidebook). In this sense, the organization has to first take a look inside, in order to determine its project management needs, through determining of the number of projects undertaken in the organization, both in general frequency and simultaneously, the length of time for project execution, and the project size and complexity, which gives information for the required number of tasks and assignments (Microsoft 2012a, b, c). Based on that, it can be decided how extensive system is actually needed, whether Single PM system, implemented for one project, or expanding to Multi PM system, Enterprise PM system for usage within the whole organization or Project collaboration platform, as an communication tool within the project-based organization (Projektmanagementsoftware, Wikipedia 2013) (http://de.wikipedia.org/wiki/Projektmanagementsoftware).

The functional requirements are derived from the processes that the tool should support ("Project Management Conceptualization" section). PMBOK states that the need for resource utilization and optimization sets system functionality requirements in terms of calculating and presenting resource breakdown structures, activities duration and interdependence, resource rates and different resource calendar views. The system should be able to provide an updated project plan and forecasts, where all interdependent calculations of on-going changes are undertaken, so that the managers can be aware of the real status and alternative options at any point of time. Functionalities of the system in terms of statistical tools and simulation techniques for estimation and cost control are needed for appropriate cost management. It is very important that those calculations are derived on basis of the business rules that define the client's approach and attitude toward costs. The collaborating functionality importance is stressed by PMI, stating that the project management tools as information distribution tools have to provide the necessary information regarding the inputs and outputs to the stakeholders, as shown in Fig. 5. The collaboration aspect asks the system to be flexible enough so that the stakeholder feedback and the on-going lessons learned and ideas for correction can be considered and implemented on time.

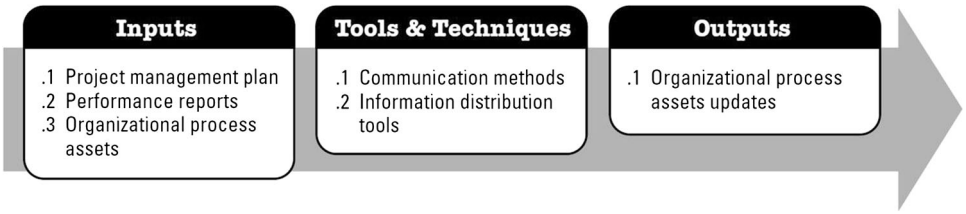

Fig. 5 Distribute information: inputs, tools and techniques, and outputs (PMBOK 2008, p. 258)

Good and understandable graphical display of the results, the notifications, reports, presentations etc. is a functionality that brings additional value (PMBOK 2008).

From the long and detailed list of required technical, performance and reporting requirements defined by the NASA knowledge centre, the following categories can be generalized as must-haves for a project management tool evaluation (NASA White Paper 2001):

- Access, collaboration and interoperability—multi-user access to files, multi-project capability, interface with other systems, interoperability with desktop tools.
- Import, export capabilities.
- Multi-user licensing and network compatibility.
- Easy-to-use, intuitive GUI, easy data modification, integration of user-defined parameters.
- Project scheduling and tracking.
- Resource, calendar, cost management, risk management features.
- Standard and customized project reports and management reporting, etc.

In the previous paragraphs, the general functions of the tools along the project management processes were mentioned. At this point, more detailed overview of the functions is seen as useful for providing additional understanding of the functional requirements. Basic functions that are present at every project management tool, as they are supporting the project management processes, are listed below (NASA White Paper 2001).

- Definition of a project calendar adjusted on the business calendar (working hours, days).
- Insertion and edition of tasks and their related cost, resource, and duration.
- Task dependencies and definition of project milestones.
- Printable project schedules in Gantt and network diagram form.
- Critical path identification.
- Insertion and edition of the actual spent time, cost and resources.
- Reporting and analysis, print options per task, cost, resource.
- Resource leveling.

We consider the features and functionalities, based on which third party web services and communities (e.g. Computer Weekly, TopTenREVIEWS, SocialCompare) evaluate existing tools as an important input for recognizing the different system requirements. In the following paragraphs, ones that have not been named till now will be listed. The criterion refers to broader scope of system descriptions that are needed for procurement decision. Not all features of the system are equally needed in different industries.

- Type of project management software: Desktop, client–server, web-based, integrated.
- Product configuration (users per account, upgrades availability).
- Security level and related features.
- Pricing: Trial period option; license form (proprietary, open source).
- Features: Lightweight Directory Access Protocol (LDAP) support; address book; meetings schedule; SSL security; e-mail notification; mobile version; customization fields.
- Document management: Document editing, sharing and storage, versioning and import.
- Communication and collaboration: Wiki, forums, blog, live chat, bookmarks, phone conferencing, web meetings.
- Languages and support (tutorials, online support).
- Workflow system.

One big distinction between the nowadays available tools is the software licensing model. There are two main development directions in terms of licensing: open source and commercial. One important argument for the open source is that the platform opens possibility for exchange of ideas and further improvements driven by people from different spheres. The idea of a free product also sounds attractive, but possible hidden costs and disadvantages should be searched for. The level of support required is something to be considered before going for open source, as high level of support is not possible in this case. Very important, in case choosing open source, one has to be sure that the required resources are available for customization and maintenance. The compliance with the regulatory and industry standards might be an issue against open source, though do not perceived to be a strong one in case of the PM tools. Emerging interesting view on the issue is the search for possibility for co- existent strategy and mixture between the system types (Vignaud et al. 2009).

As the requirements and the business needs are starting to extend the scope of standalone project management software, and some of the offered tools are already entering by definition in extended classification of the software, the concept of program and portfolio management are shortly introduced in this Section, so that the connection is underlined. The project, program and portfolio management are present in mature organizations. They differ in their focuses (PMBOK 2008). The role of the project managers in those organizations is changing as well. Jonas (2010) argues that the project portfolio managers have an important management role and this changed positioning introduces difference in the balance within them and the senior and line management.

Project management focuses on achieving the project goals, whereas program management connects and manages related projects in the company and tries to attain mutual aims. That won't be possible if the projects are managed as independent islands. How a single project influences the efficiency of the whole portfolio is an interesting research area. Martinsuo and Lehtonen (2007) found a direct mediating role. The centralized and coordinated management of the projects for multiplication of the positive result was already described as possible connection between BI and project management. In this case, BI system would be seen as program and all implemented separate tools and systems as separate projects. Further on, the portfolio is analysed on higher level, as a collection of projects and/or programs and their group management, so that the strategic business objectives could be met. In that sense, the portfolio management is a "*centralized management of one or more portfolios, which includes identifying, prioritizing, authorizing, managing, and controlling projects, programs, and other related work, to achieve specific strategic business objectives*" (PMBOK 2008). Table 1 summarizes the characteristics of project, program and portfolio management.

At this point, we will shortly mention MS Project Server, as an example of a unified project and portfolio management system. The general characteristics and applications of the portfolio management were already discussed. Those are systems that enable unified view on the organization's on-going projects and activities, with having the strategic business objectives in its focus. This high-level view is enabled with MS Project Server. The system is a nice example of a collaborative platform that enables resources and investments alignment with the strategic focus. All types of control processes are supported. Through its integration with MS Project Professional and web-based access to project scheduling, the system offers high user flexibility. The usage of Microsoft Business Intelligence platform, including Excel® Services, Visio® Services, PowerPivot for Excel, PerformancePoint® Services, SQL Reporting Services for reports and dashboards allows flexible response and reporting to the user needs (Microsoft 2012a, b, c).

The concept of on-going project management in the organizations also deals with usage of the synergy effects. Starr (1990) argues that this approach brings higher benefits and improvements than single project management, where each project is defined to have independent and static beginning and end.

The practical application and usage of a PM tool in the business sector is a good indicator for the quality of the system and its response to the demanded requirements. As one of the industries in which project management tools are longer used, and where the usage of the system adds high value to the business processes, is the construction industry, we present a short analysis of the tools used there. The professionals in the construction industry are quite frequently using this type of system so they can give a valuable input for the development direction (Liberatore et al. 2001). Deng et al. (2001) argue that information technology developments have led to many changes in the construction industry. The importance derives from the need for fast information exchange between the managers, contractors and all parties, as usually the project is implemented on a location away from the company headquarters.

Table 1 Comparative overview on project, program and portfolio management (PMBOK 2008, p. 9, adjusted)

	Projects	Programs	Portfolios
Scope	Projects have defined objectives. Scope is progressively elaborated throughout the project life cycle	Programs have a larger scope and provide more significant benefits	Portfolios have a business scope that changes with the strategic goals of the organization
Change	Project managers expect change and implement processes to keep change managed and controlled	The program manager must expect change from both inside and outside the program and be prepared to manage it	Portfolio managers continually monitor changes in the broad environment
Management	Project managers manage the project team to meet the project objectives	Program managers manage the program staff and the project managers; they provide vision and overall leadership	Portfolio managers may manage or coordinate portfolio management staff

Following are findings that derive from questionnaire directed to project management professionals at the PMI. 35 % response rate resulted in 240 filled questionnaires, out of which 42 from the industry in focus. The focus is set on answers from the construction industry representatives, as they are mostly working in project environment in companies with more than 1,000 employees. These professionals appear to have longest experience with these tools (over 30 % with more than 25 years, in comparison to 13 % between the other industries). It is also interesting that they are mostly working on fewer projects as compared to other industries, but larger, with more than 300 activities, which speaks for the system complex capacities (Liberatore et al. 2001).

Table 2 presents diverging trend in the usage of software solutions between the construction and other industries. The data refers to the solution used in the last 12 months. Primavera Project Planner (P3), (Primavera, Inc.) represents full-feature, expensive package, whereas MS Project (Microsoft Corp.) is, based on its lower price, considered as designed for mass usage. The numbers above show that Primavera is mostly used in the construction industry, which can be connected with the extensive analytical techniques contained, whereas all others mostly use MS Project as a basic package with fewer techniques. Higher usage of Primavera is also connected with the fact that the construction professionals use the system for reading, entering and editing of data, critical path analysis, etc., and that asks for better system capacities and multi-user functionalities (Liberatore et al. 2001).

The complexity of project management in that industry is a good example of the emerging potential of project management as a service. As Gann and Salter (2000) note, construction of complex systems and products asks for different capabilities, among which project management, and is very rare to find all those capabilities present within one organization. The authors recognize that project-based companies provide the link between the technical capabilities of the construction companies and their business and project processes. The business model of the project management companies is to accomplish and deliver the project for the benefit of the technical party. The specialization approach of the project-based companies enables better performance across projects (Gann and Salter 2000).

As mentioned above, the project management solutions on the market most probably have to be customized to meet the specific client requirements. There are different types of systems offered, focusing on providing a support service to specific kinds of customers, business models and processes. In the following few paragraphs we provide a short description of two exemplary project management systems, as gathered from their web sites, consultant sites or IT and project management forums. The systems in focus are activecollab, and Project HQ. The ones are chosen as they are ranking high in terms of usage, which means that they satisfy most of the general evaluation criteria. They are advanced in collaboration features, which is quite important in today's globalized world. They are also chosen in a way so that representatives from the different licensing models are given. Still, the difference in some of their features shows that there cannot be one unified approach applicable in all situations. Among other project management systems the following can be mentioned:

- Proprietary: basecamp, Project Insight, Primavera project management software packages, Blue Ant, Copper Project (Computerwoche 2013).
- Open source: OpenProj, Pleno, Projectivity Todoyu (CIO 2010).

Microsoft Project 2010 will be discussed separately due to its high applicability and in correlation with Project Professional 2010.

activeCollab® is classified as collaboration and conferencing project management tool. It is applicable for situations where the project management team is in need of an online place for meeting and collaboration, for example, when the members are working on geographically distant locations (Smashing Magazine 2008). The system major benefit is its capacity—unlimited number of projects with unlimited team members can be opened simultaneously. It is installed on an own server or local network and has web-based access where the team members can store files, discuss, read status updates, print reports, etc., available on different devices. The access rights are also personalized on user group basis. According to its web site, http://www.activecollab.com/, along the collaboration features, the basic project management functions of task scheduling, tracking, milestones, etc. are present. In terms

Table 2 Comparison of PM software package used in construction versus total survey (Liberatore et al. 2001, p. 104)

Number of analytical features used (1)	MS Project (2)	Primavera (3)	All others (4)	Total construction (5)
Total construction	9 (24.3 %)	19 (51.4 %)	9 (24.3 %)	37 (100 %)[a]
Total survey	102 (49 %)	44 (21.2 %)	62 (29.8 %)	208 (100 %)[b]

[a] Five surveys (11.9 % of 42) had no responses

[b] Thirty-two surveys (13.3 % of 240) had no responses

of licensing, it is a proprietary system with two pricing options, for small business and extended corporate package where additional project management features are available, as calendar, project tracking, etc. The two packages differ also in the support and upgrades offers.

Project HQ is an example for an open source project management tool. According to its features, it is classified to be similar to activecollab, as it is collaboration tool. The system is fully database independent, meaning the user can set the database on a database server of his choice. Project HQ is written in Python. It contains workflow applications for easier project managing (CIO 2010). It includes standard project management features, as tasks lists, milestones, as well as wiki feature. It is classified to be among the five best evaluated open source PM systems. The perspective of the systems arises from the general characteristics of an open source platform. It is being developed along the way, and it gives flexibility to the user due to the openness of the code and some features as for example customizable CSS. This, from the other side, opens market for additional customization services. According to its web site, http://www.projecthq.de, there is also stable version offered for usage.

We chose to analyse MS Project as it offers tailored products for different audience. There is a Standard and Professional version of the MS Project 2010 desktop application. Its system requirements are easily obtainable and its look and feel is already familiar to most of the users from the other widely used Microsoft Office applications. That saves usage and orientation time. The system is intuitive and easy to use, and with that fulfils that evaluation criterion stated as important above. Its communication with the other often used MS Office applications (MS PowerPoint, MS Excel) scores high on the import/export requirement as well. The creation of baselines and ability to compare actual and scheduled budget is an additional monitoring feature with built-in earned-value metrics for appropriate performance management. Its increased visibility of overbooking, conflicts and resource utilization degree adds additional value. Its advancement in the collaboration features shows it up-to-datedness with the general requirement development directions. As mentioned, MS Project versions can be used by individuals, small business and large companies. Both Project Standard 2010 and Project Professional 2010 are offered in 32-bit and 64-bit options for better performance, so that they can support managing of larger and complex projects. The advanced features are of course, to be found in the professional edition, which is marketed for big companies (Microsoft 2013). As for the purchasing and licensing options, it follows the general Microsoft approach, with selling one edition or offering volume licensing special prices. When analysing the option for purchasing a certain product, its history may give quite useful information. MS Project shows features enhancement through its versions 2003, 2007 and the current 2010 editions. The number of new features added between the versions shows the progress in the development of the tool and its up-to-datedness with the overall market and features development. In that sense, some advanced, nowadays important features are to be found in the newest versions. The history somehow gives stability and promises further advancements. In this sense, the project collaboration features, as enhanced copy/paste, saving files to SharePoint for team usage is to be found in the MS Project/MS Professional. As for the Professional edition, there is a possibility for evaluation of different scenarios. The collaboration requirement is also more fulfilled here, as the synchronization of SharePoint Foundation 2010 and Project Professional 2010 enables setting status updates by usage of the Microsoft Web App and saving and sharing files with the other team members. Additional important feature of the Professional edition is the possibility to publish projects on Project Server 2010. With that, this edition supports not only project but program management also (Microsoft 2013).

Conclusions

Due to the market developments and competition increase, the project-based workload in organizations is increasing, even in companies that were traditionally not working in this way. With this the need for appropriate project management system is increasing. Our work discussed the project management concept because the one is basis for right assessment of client needs and poses evaluation criteria that have to be considered when deciding on a certain solution. As the broader picture of integrated projects for attainment of the strategic objectives is essential for long-term profitability and sustainability, the characteristics of the program and portfolio management systems can be further researched.

One thing is sure when speaking about developments in the software industry—advancement and improvement are always possible. One smart approach for searching for ideas for further development directions of the tools in today's customer driven markets is of course analysing the needs of its heavy users. Liberatore et al. (2001) present some research direction suggestions by the construction industry users: further integration of the systems with other tools and enterprise systems, increase in the level of system flexibility, easier usage of the system and less costly training options. It is important to understand that the existence of a general solution that fully reflects the needs of a company and does not require the service of customization is highly unlikeable, as the companies have differing needs. The same project management techniques and approaches are not necessarily

equally effective in different companies. That is why the internal analysis of the company and knowledge of the business needs is prerequisite for successful selection and tool implementation. Open source examples provide even better understanding of the need of project management as a service because the tool itself is on disposal at no cost, but the client has costs for the service of functionality adjustments. It is very important to understand that the project management tools support the project manager, but do not perform the project management instead. They should be seen as tools that provide repository of data and make logical calculations and signals, but the system will be only good as to the extent the people use it (Stoshikj et al. 2013). However, it does not mean that the project management performance cannot be actually done by other party and with it optimized. Project management can be offered as a service by a third company specialized in managing projects in different industries. Nevertheless whether performing project management for another party, or customizing a software solution for it, the service company has to work closely with the client and know his practices, so that the value delivered is high.

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Key Questions

1. What are the factors behind the increased interest in project management?
2. Can project management be analysed from a service point of view?
3. In which service forms can project management be offered?
4. What are the criteria for choice of an adequate project management tool?
5. What are the requirements that a project management system should fulfil in order to deliver a quality service?

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