Application and Usage of the Standards for Project Management and their Comparison

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Abstract: A standard is "a collection of knowledge areas that are generally accepted as best practice in the industry". Different standards for project management are used over the last 25 years. There have been several attempts to develop project management standards such as capability maturity model from the software engineering institute. GAPPS, global alliance for project performance standards an open source standard describing competencies for project and program managers. A guide to the project management body of knowledge from the Project Management Institute (PMI) HERMES method, a Swiss general project management method, selected for use in Luxembourg and international organizations. The ISO standards ISO 9000, a family of standards for quality management systems and the ISO 10006, for quality management systems and guidelines for quality management in projects. PRINCE2, project in controlled environments. Association for project management body of knowledge. Team Software Process (TSP) from the software engineering institute. Total cost management frame work, AACE International's methodology for integrated portfolio, program and project management. V-model, an original systems development method. The logical framework approach which is popular in international development organizations. IAPPM, The international association of project and program management, provides guidelines for project auditing and rescuing troubled projects. It is not easy to decide which standard to use and create project templates. In order to understand the basics of project management it is necessary to define the basic concepts and to become familiar with already established practice and internationally recognized standards. In the early 90's are usually used IPMA ICB standard and then there was another world standards PMBOK, PRINCE2 and ISO 21500.

Key words: Management, process, project, standard, internationally

INTRODUCTION

We can meet with different projects, for example research projects, investment projects, educational projects, strategic-development projects and the like. Project management is the focus of many other industries and by branch, who share their resources and experiences. Project management is followed up by other disciplines such as the risk analysis, Human resource management, cost management, portfolio management of projects, program management of projects and many others. The effort to successfully complete projects led to the development of various project management techniques, tools and the resources dealing with general project management. For project management are most often used norms and standards such as PMBOK, PRINCE2, IPMA ICB and their handbooks. The study compares advantages and disadvantages of standards and norms for projects (generally). The first part describes the characteristics of these standards and their processes, components and relationships. The second part deals with comparing these standards, explaining their advantages and disadvantages for project management. The effort to successfully complete projects or job orders led to the development of various project management techniques and tools (Dhanalakshmi *et al.*, 2009). Some of the tools to acquire knowledge are the literary resources dealing with general project management (Yazid *et al.*, 2014). Project management is also the focus of many global communities who share their resources and studies. Very up-to-date and practical are the internet interest and business sites (ScienceDirect.com; pmworldlibrary.net) issuing magazines and publications (Procedia; PM World Journal). Here, it is possible to find not only the practical experience of project managers but also the contributions of trainers and academics (Asgari, 2016).

Standard Project Management Body of Knowledge (PMBOK): The methodology according to the publication "A Guide to the Project Management Body of Knowledge" (PMBOK) from the Project Management

Table 1: Project process group and knowledge area mapping

| | | | Project management process groups | | |
| | | | --- | --- | --- |
Knowledge areas	Initiating	Planning	Executing	Monitoring and controlling	Closing
Project integration management	Develop project charter	Develop project management plan	Direct and manage project work	Monitor and control project work Perform integrated Change control	Close project or phase
Project scope management		Plan scope management Collect requirements Define scope Create WBS		Validate scope Control scope	
Project time management		Plan schedule management Define activities Sequence activities Estimate activity resources Estimate activity durations Develop schedule		Control schedule	
Project cost management		Plan cost management Estimate costs Determine budget		Control costs	
Project quality management		Plan qualityt managemen	Perform quality Assurance	Control quality	
Project human resource management		Plan human resource management	Acquire project team Develop project team Manage project team		
Project communications management		Plan communications management	Manage communications	Control communications	
Project risk management		Plan risk management Identify risks Perform qualitative Risk analysis Perform quantitative Risk analysis Plan risk responses		Control risks	
Project procurement Management		Plan procurement Management	Conduct procurements	Control procurements	Close procurements
Project stakeholder management	Identify stakeholders	Plan stakeholder management	Manage stakeholder mangagement	Control stakeholder engagement	

Own modification and PMI (2013)

Institute (PMI) the base of the methodology was defined in the 1970's by the standards of the US Army which were later adopted to the US industry standards. This philosophy was applied to commercial projects and thus PMBOK originated. The basic approach here is the process-based concept of management issues. The current edition is from 2013, marked the 5th edition. Project Definition (PMI, 2013).

"A project is a temporary endeavour undertaken to create a unique product, service or result. The temporary nature of projects indicates that a project has a definite beginning and end (Table 1)."

Project management definition (PMI, 2013): "Project management is the application of knowledge, skills, tools and techniques to project activities to meet the project requirements". According to PMBOK, PMI recommends viewing the project management in a procedural manner

and its methodology aims as covering all aspects of project management. PMBOK divides the management processes into five groups and ten basic areas of knowledge (PMI, 2013).

Project management process groups (Fig. 1) five groups of project management processes:
- Initiating-decision on project implementation and selection
- Planning-design, maintenance and changes to the plan for a successful completion of the project
- Executing-coordination of resources for the project implementation
- Monitoring and controlling-ensuring the achievement of the goals of the project and monitoring
- Closing-handover of the project to user

Project management knowledge areas-areas of project management knowledge: Ten knowledge areas that are used by PMI and applied in practice:

- Integration describes the processes required for project coordination (plan development, plan implementation, coordination of changes)
- Scope-describes the processes ensuring all the required works
- Time-describes the processes for the timely completion of the project
- Costs-describes the processes associated with the approved budget (resource planning, cost estimation, budgeting and operational cost management)
- Quality-describes the processes associated with quality planning and assurance for a successful completion
- Human resources-describes the processes for the efficient use of labour (organizational planning, personnel and project teams)
- Communication-describes the processes for proper and timely transmission of information
- Risk-describes the processes associated with searching for, identifying, analysing and responding to risks
- Procurement-describes the processes associated with the provision of supplies and services (demand, selection of resources, contractual relationships)
- Stakeholders describes the proper involvement of all stakeholders participating in the project

Table 1 shows a map of mutual relation of the areas of knowledge and process groups. Process groups are divided into sub-processes marked by PMBOK and are assigned to individual areas of knowledge. The processes comprise the inputs to which the tools and techniques are applied and those generate outputs that result from the process. A detailed description of inputs, outputs, tools and techniques can be found in the PMBOK guide.
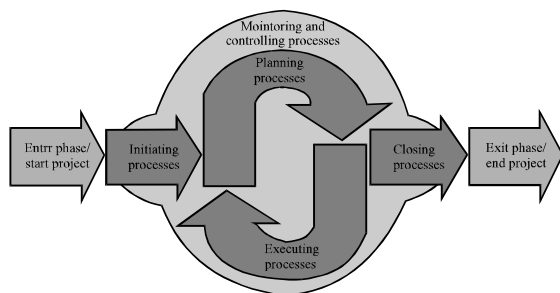

Fig. 1: Project management process groups according to PMI

MATERIALS AND METHODS

Standard Project in Controlled Environments (PRINCE2): The methodology according to the PRINCE2 standard-it is a British Standard owned by the Office of Government Commerce (OGC) and is managed by APM Group. Ltd. Process concept of the methodology is based on the assignment of the british ministry of industry and Trade which initially used it for the management of government IT projects. Presently valid guide is the "Managing Successful Projects with PRINCE2TM" of 2009.

Project Definition (OGC, 2009): "A project is a temporary organization that is created for the purpose of delivering one or more business products according to an agreed business case."

Project management definition (OGC, 2009) (Fig. 2): "Project management is the planning, delegating, monitoring and control of all aspects of the project and the motivation of those involved, to achieve the project objectives within the expected performance targets for time, cost, quality, scope, benefits and risks." Figure 3 shows three integrated PRINCE2 areas in the project environment the seven principles, seven topics, seven processes (OGC, 2009).

The seven PRINCE2 principles (OGC, 2009):
- Continued business justification-constant assessing of the reasons for the implementation of the project
- Learn from experience-learning from previous projects and documented experience
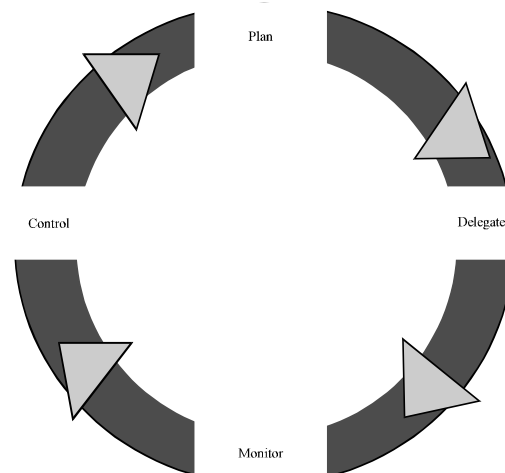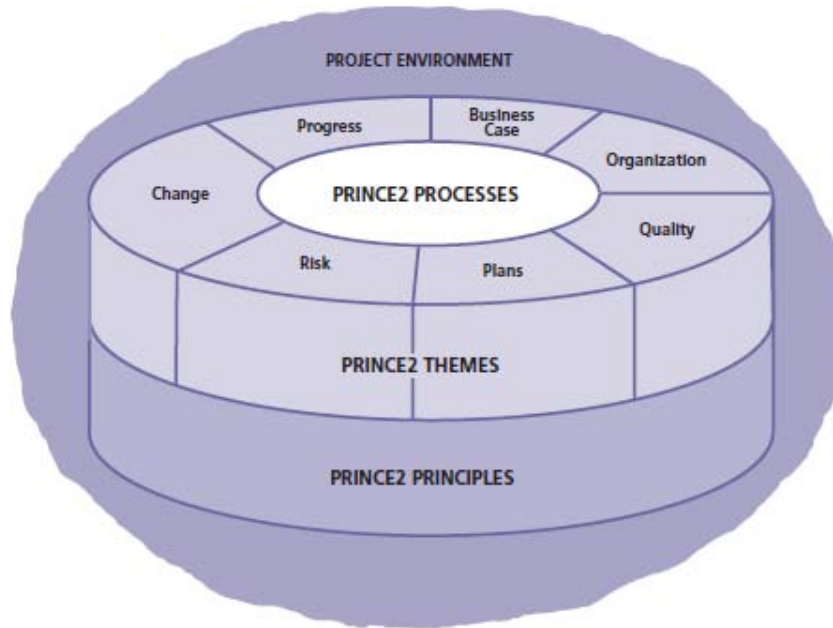

Fig. 2: Project management

Fig. 3: The structure of PRINCE2

- Defined roles and responsibilities providing a detailed description of the roles for stakeholders
- Management through stages-planning, managing and monitoring after successive stages with continuous evaluation
- Manage by exception-defining tolerance (in terms of time, funds and capacities) for each defined power
- Focus on products-focusing on the benefits and delivery of the product within the project (what and how)
- Tailor to suit the project environment-adapting the methodology to the current project environment

The seven PRINCE2 topics:
- Business case-consists of mechanisms to assess whether the project is desirable, achievable and viable. Question: Why?
- Organization-defines the structure of responsibilities Question: Who?
- Quality-defines the means and implementation of product validation. Question: What?
- Plans outlines the methods of management to deliver the products. Questions: How, how much, when?
- Risk defines the methodology for identifying, evaluating and reducing the amount of risk. Question: What if?
- Change defines the methodology for identifying, evaluating and managing changes. Question: What will be the impact?

- Progress defines the methodology for monitoring and comparing actual achievements against planned ones. Questions: Where are we now, where are going, do we have to worry?

The seven PRINCE2 processes:
- Starting up a project-the process preceding the project run that aims to ensure the prerequisites for a successful project set-up. It is launched by the mandate of the project which provides the reason, purpose and quality
- Initiating a project the preparation of detailed and solid plans for understanding the work that needs to be done before it comes to investment in the project.
- Directing a project-the continuous process that takes place throughout the period of a project. It allows the project committee to take responsibility for the success of the project and issue operational instructions as required by the project managers
- Controlling a stage-the process that describes the controlling activity of a project manager
- Managing product delivery-the process of delivering products within the project
- Managing a stage boundary-the completion of a project phase with subsequent control and evaluation of the project status
- Closing a project the completion of the project with the registration of knowledge for a successful management of other projects

RESULTS AND DISCUSSION

Standard according to IPMA Competence Baseline (IPMA ICB): The European standard IPMA ICB-was created in the sixties of the last century and is managed by a professional organization entitled International Project Management Association (IPMA). The IPMA ICB standard focuses on competences and skills of the project managers and the team members. Standard IPMA ICB recommends process steps that are applied to specific project situations. Currently the czech republic recognises applicable national standard of project management competences linked to IPMA (2006).

Project definition (IPMA, 2006): "A project is a process limited in terms of time, cost and resources, implemented in order to produce defined outputs (scope of achievement of the project goals) in terms of quality, standards and requirements. The goal of the project is to achieve a predefined state which has been agreed in the specific business case.

Project management definition (IPMA, 2006): "Project management is a professional discipline utilizing firmly defined standards and guidelines for the work of employees in the area of project management. These requirements are defined by the acquisition, processing and standardization of the accepted and used project management competencies.

Eye of competences (Fig. 4) shows the integration of all the components of project management from the perspective of project manager when evaluating a specific situation. Table 2 shows a list of 46 project management competence activities divided into three areas according to their focus. Table 2 project manager competences according IPMA ICB.

Contextual competences:
- Project orientation
- Programme orientation
- Portfolio orientation
- Project, programme and portfolio implementation
- Permanent organization
- Business
- Systems, products and technology
- Personnel management
- Health, security, safety and environment
- Finance
- Legal

Technical competences:
- Project management success
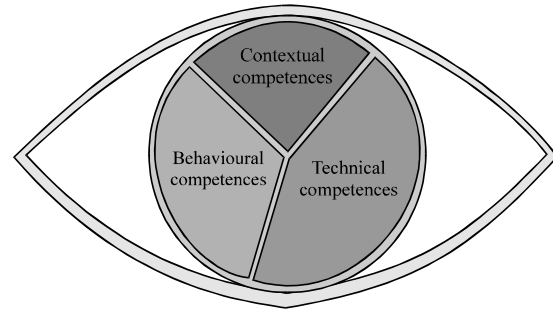- Interested parties

Fig. 4: Eye of competencies according to IPMA ICB

- Project requirements and objectives
- Risk and opportunity
- Quality
- Project organization
- Teamwork
- Problem resolution
- Project structures
- Scope and deliverables
- Time and project phases
- Resources
- Cost and finance
- Procurement and contract
- Changes
- Control and reports
- Information and documentation
- Communication
- Start-up
- Close-out

Behavioural comepetences
- Leadership
- Engagement and motivation
- Self-control
- Assertiveness
- Relaxation
- Openness
- Creativity
- Results orientation
- Efficiency
- Consultation
- Negotiation
- Conflict and crisis
- Reliability
- Values appreciation
- Ethics
- IPMA (2006)

The newly released fourth version of the IPMA standard redefined the eye of competencies as an area of twenty-nine competencies of a modern project manager
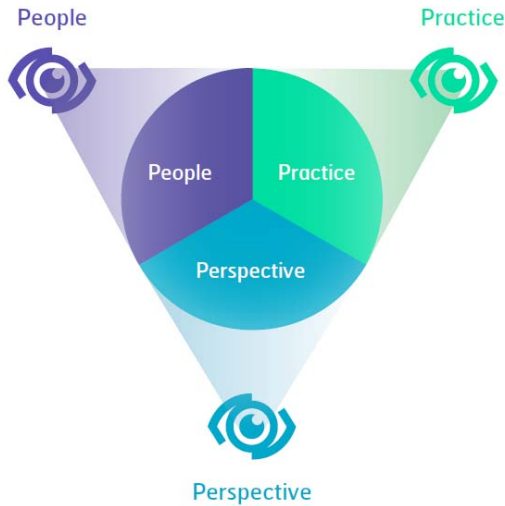
Fig. 5: Predefined eye of competencies according to IPMA (2015)

for the project, program and portfolio management. Competencies are divided into three areas: people, practice and perspective (Fig. 5).

- Human skills-include personal and interpersonal skills necessary for a successful participation in or leadership of a project, program or portfolio
- Practical skills-are specific methods, tools and techniques used in the projects, programs and portfolios in order to achieve their success
- Prospective competence-incorporate methods, tools and techniques through which individuals act on the environment as well as the reasons that lead the people, organizations and society to initiate and to support projects, programs and portfolios (IPMA, 2015)

There is a newly revised definition of the project: "A project is a unique, temporary, multidisciplinary and organised effort to implement the agreed outputs within a pre-defined requirements and constraints."

Standard-Guidance on Project Management ISO 21500: This international standard provides a description of the concepts and processes that represent best project management practice. The projects are included in the context of programs and portfolios of projects but this international standard does not provide a detailed guidance on the management of these programs and portfolios of projects (ISO 21500). The latest version of the ISO 21500 standard was released in 2012.

Project definition (ISO, 2012): "A project is a unique set of processes consisting of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective."

Project management definition (ISO, 2012): "Project management is the application of methods, tools, techniques and competences to a project. Project management includes the integration of the various phases of the project life cycle. Project management is accomplished through processes."

ISO 21500 is the first in a planned family of project management standards. It is designed to align with related International Standards such as ISO 1006, quality management systems-guidelines for quality management in projects, ISO 10007, quality management systems guidelines for configuration management, ISO 31000, risk management principles and guidelines and some sector-specific standards in industries such as aerospace, engineering, IT, etc., additional benefits of ISO 21500 include.

- Encourage transfer of knowledge between projects and organizations for improved project delivery
- Facilitate efficient tendering processes through the use of consistent project management terminology
- Enable the flexibility of project management employees and their ability to work on international projects
- Provide universal project management principles and processes

Comparison of project management standards: To select the appropriate methodology, it is important to reflect on the practical use of individual procedures or combinations thereof. The comparison of the various standards was already addressed by several authors and studies in the past. Below are the summaries of their findings.

Comparison of ISO 21500 and the PMBOK: A simple comparison discovered a great similarity between PMBOK Guide 5th and ISO 21500. The ISO 21500 at its inception was based on the PMBOK Guide 4th released in 2008. The introduction of ISO 21500 was followed by the publication of PMBOK Guide 5th in 2013 which moved the "stakeholders" from the area of "communication" to the area of "knowledge" which has been a major step to approximation of ISO and ANSI standards. The two systems differ in only a few technical details.

The comparison with other standards can be inferred from the article in PM World Today (Ghosh *et al.*, 2015) entitled "Enhance the Pmbok" by Comparing it with P2M,

RBI, PRINCE2, APM and Scrum Project Management Standards". For our purpose, we focus on the part associated with IPMA ICB and PRINCE2. The comparison is complemented with new items deriving from PMBOK Guide 5th. IPMA ICB and PMBOK Compared, adjusted by Ghosh *et al.* (2015).

Matches of IPMA ICB and PMBOK: Both guides can be implemented in different ways so as to suit the specific needs of the customer. IPMA ICB has forty-six competencies used by the project manager at various levels of the relevant project. PMBOK Guide 5th uses forty-seven processes at various stages in the project. IPMA ICB competencies can be applied to the areas of knowledge and groups of processes according to PMBOK.

The competencies in the IPMA ICB are interrelated as well as the processes in PMBOK. An output from one process may be used in PMBOK as an input to another process and equally in the IPMA ICB the information from one competency can link to another one.

Differences between IPMA ICB and PMBOK: IPMA ICB focuses on the assessment of skills and abilities of the project manager and the project team whereas PMBOK addresses the processes in the project. IPMA ICB emphasises behavioural competencies and personal relationships in the team. PMBOK focuses on technical skills. PMBOK defines a project as a temporary effort to create a unique product or service. IPMA ICB defines a project as a time-and cost-limited process implemented in order to achieve defined outputs with an emphasis on the quality and satisfaction.

Shortcomings of IPMA ICB compared to PMBOK: The capacity to complete the job is more important in PMBOK than the competencies defined in IPMA ICB PMBOK focuses on the implementation of the project. PMBOK sets out detailed tools and techniques for forty-seven processes. An IPMA ICB expert must obtain the tools, techniques and information from other sources. However, this feature provides IPMA ICB with a greater flexibility in the present world. RBI places greater emphasis on human skills while PMBOK puts more emphasis on the procedural skills. However, both skills are important in projects. PRINCE2 and PMBOK Compared, adjusted by Ghosh *et al.* (2015).

Matches of PRINCE2 and PMBOK: PRINCE2 defines a project as a temporary organization that is created in order to provide one or more business products according to an agreed business case. PMBOK defines a project as a temporary effort to create a unique product, service or

result. PRINCE2 defines the role of the project manager as oriented on achievement of the project goals within the targets set in terms of the time, cost, quality, quantity, benefits and risks. PMBOK says that the role of the project manager is to cooperate closely with the portfolio or program manager to achieve the objectives of the project and to ensure the fulfilment of the project plan within the program. The variables are defined in PRINCE2 as time, costs, quality, scope, benefits and risks. The same variables are identified as project constraints in PMBOK.

PRINCE2 topics are comparable with the areas of knowledge of PMBOK. PMBOK also includes the area of public procurement. PMBOK and PRINCE2 process groups are very similar and equal. The only difference in PRINCE2 consists in the process of "Launching of the project" which is not contained in PMBOK. PRINCE2 has forty competency activities that occur throughout the project in a variety of processes which is comparable with 47 processes in PMBOK.

Differences between PRINCE2 and PMBOK: PRINCE2 highlights the key risks of the project. PRINCE2 identifies why projects fail and aims to reduce the failure rate by removing the cause of failure through the management, control and proper tools and techniques employed. PMBOK aims to increase the success of the project by setting up the processes, tools and techniques.

PRINCE2 places emphasis on product planning. Product Breakdown Structure (PBS), Product Description and product flow diagram are the key to the product-based planning. In PRINCE2 the control is addressed by approval and division of the project into manageable phases and milestones.

In PRINCE2 the technical competencies are intended for specialised tasks and challenges. The management phases are intended for the stakeholders. PMBOK does not make this distinction.

PRINCE2 classifies the stakeholders into three categories: business sponsor, user and supplier. The commercial sponsors are those who deal with the financial benefit of the project. The users are people who will use the product as soon it is ready. The suppliers provide expertise and resources to the project and then deliver the products. PMBOK defines the stakeholders as entities or organizations that are actively involved in the project or whose interests may be positively or negatively affected by the course and completion of the project.

PRINCE2 introduces and observes procedural structure that can be reduced depending on the project size. PMBOK prescribes tools and techniques at a high technical level, often serving as a performance-based standard.

Shortcomings of PRINCE2 compared to PMBOK: PMBOK includes the processes needed in the area of public procurement. PRINCE2 makes no mention of the public procurement. PMBOK contains detailed information that can be used for each competency that it addresses. Each of these competencies has a dedicated section of tools and techniques with detailed information. PRINCE2 simply lists suitable techniques for the project but does not provide any details in their regard. PMBOK addresses the human resource management with a wealth of knowledge which includes developing a plan of human resources, acquisition, development and management of the project team. PRINCE2 provides no information dealing with human resources and human resource management.

PMBOK enriches the information regarding soft skills with greater details leading to reduced conflicts and enhanced teamwork and it highlights the importance of leadership skills for a project's success. In terms of the soft skills, PRINCE2 only mentions that the best educational and training programs should be used for specific environments

CONCLUSION

All of the above standards are designed to increase the success of the project by emphasizing various competencies (Asgari, 2016; Valitov, 2016).

Project Management Body of Knowledge a generated and maintained PMI and based on five process groups and nine knowledge spheres. To explain its activity, the PMI organization state: "we offer standards to experts and organizations that describe the good practice and worldwide accepted authorization that proves the knowledge of project management and the means to develop and create networks and communities".

PMI ranks among the leading non-profit expert organizations supporting all entities dealing with project, program and portfolio management. During its existence, PMI has contributed to a number of successes in different organizations thanks to the project management development through worldwide recognized standards, certification, resources, tools, academic research, publications, courses and/or medication of contacts.

PRINCE2 a methodology emerged and owned by the British Ministry of Industry and Trade. It has been formed by a number of successful companies and is equally known as the above mentioned PMBOK. It is an easily adaptable and distributable management method for any project type, based on the process-based approach to project management. Thanks to the availability of courses, a number of materials and certifications, this method has

also become an internationally expanded and recognized method. The method is based on seven principles, seven processes and seven topics.

IPMA competence baseline a standard generated by the International project management association is based on the competences, i.e., on the knowledge and skills of the project, program and portfolio managers and of the members of their teams. It is not a standard based on a process model. It is distinguished from the previous two models as it does not provide tools and techniques.

ISO 21500-a standard is not certifiable at present which distinguishes it from the two previous standards. These are "instructions related to the terms and processes of project management that are important for the course and material fulfilment of the project and which influence it". It certain similarity can be seen with the PMI standards. This norm does not give instructions for program management and project portfolio management, either.

PRINCE2 is a systemic "cookbook" containing recipes that will help you "cook well" your projects. PMI is the "kitchen equipment" it provides a broad range of tools and techniques which you may use for a successful management of your projects. IPMA defines a "good cook", i.e., what capabilities a project management specialist should have.

For the generally area (engineering, construction, metallurgy, etc) and for their projects, it is possible to use a combination of all standards (Yunus and Latiffi, 2016). For these reasons, the currently proposed projects are used structure:

- Description of the project and its phases
- Market analysis, demand estimation, marketing strategy and marketing mix
- Management of the project and human resource management
- Technical and technological solution of the project
- The project's impact on the environment
- Ensuring investment assets
- Management of working capital
- Financial plan and project analysis
- Evaluation of the effectiveness and financial stability of the project
- Risk management
- Project schedule
- Final evaluation of the project

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