

PROJECT MANAGEMENT STANDARDS

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Purpose: The aim of the paper is to analyze the main project management standards and topics connected with quality management in projects.

Design/methodology/approach: Critical literature analysis. Analysis of international literature from main databases and polish literature and legal acts connecting with researched topic.

Findings: The considerations presented in the publication made it possible to analyse the most important aspects of project management in the context of quality management. The publication concentrate on problems connected with various aspects of project management. The paper says about ISO and non ISO related projects trying to characterize and compare various types of standards and approaches. There is a special attention towards analysis of quality management in projects. Especially problems connected with risk in process which are important part of quality management and also play important role in ISO 9001 quality management standards. Paper also contains some analysis connected with the impact of COVID-19 pandemic on the project management and try to conclude main methods how to manage teams in project management in virtual environment.

Originality/value: Detailed analysis of all subjects related to the problems connected with project management in the context of standards and quality management.

Keywords: project management, industrial management, ISO standards, quality management, project, Industry 4.0.

Category of the paper: literature review.

1. Introduction

In the times of Industry 4.0 implementation project management plays important role in improving the processes and effectiveness of the organizations (Drizd and Wolniak, 2021; Gajdzik and Wolniak, 2021, 2022; Grabowska et al., 2019, 2020, 2021). Consisting project goals they can be classified into two groups: industrial projects and developmental projects (Sułkowski and Wolniak, 2016, 2018; Tuthill, 2014; Wolniak and Sułkowski, 2015; Wolniak and Skotnicka-Zasadzień, 2014; Wolniak, 2011). The differences between them are

characterized in table 1. Industrial projects are also characterized as commercial projects are undertaken to provide goods and services for meeting the growing needs of the customer and providing attractive return to the stake holders. Development projects are undertaken to facilitate the promotion and acceleration of overall economic development (Introduction, 2021).

Table 1.

Differences between industrial projects and developmental projects

Dimension	Industrial project	Developmental project
Scale of project	Limited	Large
Promoters	Entrepreneurs or corporates	Government, Public Sectors, NGOs
Investment	-	High
Gestation period	-	High
Profitability	High, Considered on IRR (Internal Rate of Return)	Modest, Considered on ERR (Economic Rate of Return)
Finance	Stringent debt equity norms	Operates on higher debt-equity norms
Source of fund	National stock markets and from domestic financial institutions	International organizations like World Bank, IMF, ADB, DFID and others mostly as loan, yet times providing for some grants
Interest rate and repayment period	Market rate and the repayment period is generally 7 to 10 years	Very low for borrowed funds and the repayment period extends up to 25 years and even beyond

Source: (Introduction, 2021).

There are many project management standards on the market (Wolniak, 2013, 2014, 2016, 2017, 2018, 2019, 2020, 2022). The aim of the paper is to analyze the main project management standards and topics connected with quality management in projects.

2. ISO related standards

To manage help in the process of managing project there are some special ISO standards (ISO 21500:2020; ISO 21504:2015):

- ISO 21500:2020 Guidance on project management.
- ISO 21504:2015 Project, programme and portfolio management – Guidance on portfolio management.

ISO 21500:2012 provides guidance for project management and can be used by any type of organization, including public, private or community organizations, and for any type of project, irrespective of complexity, size or duration. ISO 21500:2020 provides high-level description of concepts and processes that are considered to form good practice in project management (Billows, 2014; Gębczynska and Wolniak, 2018). Projects are placed in the context of programmes and project portfolios, however, ISO 21500:2012 does not provide detailed guidance on the management of programmes and project portfolios (Lewis, 2011; Stawiarska

et al., 2020; Stawiarska et al., 2021). Topics pertaining to general management are addressed only within the context of project management (ISO 21500:2020).

ISO 21504:2015 provides guidance on the principles of project and programme portfolio management. ISO 21504:2015 is relevant to any type of organization including public or private and any size organization or sector (Czerwinska-Lubszczyk et al., 2022). The guidance presented in ISO 21504:2015 is intended to be adapted to suit the specific environment of the project and programme portfolio.

Also there are some others additional ISO standards and documents in progress:

- ISO/CD 21503 Guidance on programme management.
- ISO/DIS 21505.2 Project, programme and portfolio management – Guidance on governance.
- ISO/AWI TR 21506 Vocabulary for Project, Programme and Portfolio Management.
- ISO/AWI 21508 Earned Value Management.
- ISO/AWI 21510 Project manager competencies.
- ISO/AWI 21511 Work Breakdown Structure (WBS).

3. Non ISO related standards

Also in project management there are many non ISO standard which are very widespread and removed:

- ANSI/PMI Standard PMBOK® Guide.
- PRINCE2™ Project Management Methodology.
- IPMA Competence Baseline ICB.

In table 2 there is a short characteristic of mentioned standards.

Table 2.

Non ISO related project management standard

Standard	Characteristic
ANSI/PMI Standard PMBOK®	<p>The PMBOK Guide is intended to be a "subset of the project management body of knowledge that is generally recognized as a good practice. 'Generally recognized' means the knowledge and practices described are applicable to most projects most of the time and there is a consensus about their value and usefulness. 'Good practice' means there is a general agreement that the application of the knowledge, skills, tools, and techniques can enhance the chance of success over many projects."</p> <p>A Guide to the Project Management Body of Knowledge — Sixth Edition provides guidelines for managing individual projects and defines project management related concepts. It also describes the project management life cycle and its related processes, as well as the project life cycle. and for the first time it includes an "Agile Practice Guide".</p>

Cont. table 2.

PRINCE2™ Project Management Methodology	PRINCE2 provides an integrated framework of processes with activities and referenced tools and techniques to be performed for the proper management of a project from its start to the end. It details what needs to be done, by whom, and when. Also, it includes an integrated and inter-linked set of practical templates as the documented support for project management deliverable products. A methodology is generally prescriptive, and it deals with all project management organization roles but does not cover interpersonal skills.
IPMA Competence Baseline ICB	The IPMA Individual Competence Baseline (IPMA ICB®) is the global standard for individual competence in project, programme and portfolio management. The IPMA ICB supports the development of individual competence through the presentation of a complete inventory of competence elements across projects, programmes and portfolios. IPMA's goals with IPMA ICB are simple – to enrich and improve the individual's competence in project, portfolio and programme management and to provide an inventory of competences that, if fully realized, represent complete mastery of these management domains. Projects, programmes and portfolios are at the forefront of change in the world today. Projects drive the development of new products and services, investments and expansion, capabilities, the implementation of new strategies and a new generation of infrastructure. We recognise that projects begin and end with people and that competent execution is at the heart of every successful project.

Source: Own work based on: (Virtual hires, 2014; Project Management, 2013).

4. Quality management in projects

Very important part of the project is its quality management. There is a special ISO specification (ISO 10006:2018) dedicated to quality management on projects (Kordel and Wolniak, 2021; Kwiotkowska et al., 2021, 2022; Orzeł and Wolniak, 2022; Ponomarenko et al., 2016). It is applicable to organizations working on projects of varying complexity, small or large, of short or long duration, being an individual project to being part of a programme or portfolio of projects, in different environments, and irrespective of the kind of product/service or process involved, with the intention of satisfying project interested parties by introducing quality management in projects (Juran, 1992; Kerzner, 2019; Wolniak, 2021). This can necessitate some tailoring of the guidance to suit a particular project. This document addresses the concepts of both “quality management in projects” and “quality management systems in projects” (ISO 10006:2018; Wolniak and Sułkowski, 2015; Wolniak and Grebski, 2018; Wolniak et al., 2019; Wolniak and Hąbek, 2015, 2016; Wolniak and Jonek-Kowalska, 2021, 2022; Wolniak et al., 2020).

In every project we should use risk management methods to analyses and prioritize risk. We can define risk as following (We, 2020):

- A risk is a potentiality that, if it materializes, can have an impact on one or multiple objectives in a negative or positive manner, in the form of resources, performance, quality, or timeline. This differs from a problem or issue, which is something that has already occurred and is already having an impact.

- An opportunity is a positive risk, which occurrence is favorable to one or multiple project objectives.
- A threat is a negative risk, which occurrence can endanger one or more of the project objectives.

The likelihood of most events is influenced by both exogenous as well as endogenous factors.

In general sources of exogenous uncertainty include (Klastorin, 2004):

- changes in technology,
- government regulations or policies,
- unexpected losses due to deterioration, theft, etc.,
- market fluctuation in prices and suppliers,
- legal and contractual issues,
- natural hazards such as weather delays, earthquakes.

Endogenous risk include (Klastorin, 2004):

- variations in component performance,
- inaccurate or incomplete data,
- personnel issues,
- impacts of other projects,
- cash flow,
- inability to accurately forecast due to lack of data, experience or foresight.

We can divide risk into two types (Resiss, 1995):

- Qualitative risk – refers to the general type of risk that can be imagined and foreseen but can only be discussed in general terms. Sure, you can put some simple numbers to some of these risks but the mathematics is going to be dead simple.
- Quantitative risk – brings risk and critical path analysis together along with mathematics, probabilities and Monte Carlo techniques. Here you must start off with a critical path diagram of the project created within the bowels of a project planning software package. These packages bear the tag ‘project management software’ but it is just not true—they are only planning tools.

To analyze risk project manager should calculate risk score which is determined by the product of the risk’s probability of occurrence and magnitude of the impact (Wolniak and Skotnicka, 2011; Wolniak and Skotnicka-Zasadzień, 2008, 2010, 2018, 2022; Wolniak et al., 2019; Wolniak and Sułkowski, 2016). Risk management is an organized, systematic decision-making process for efficiently planning, assessing, handling, monitoring, controlling and documenting risk in order to increase likelihood of achieving projects goals and decrease the likelihood that a risk becomes a future problem (Smart, 2021; Hyttinen, 2017; Harris et al., 2020). The risk management plan focus on the relationship between risk and their characteristics, such as risk exposure and project importance to the organization and stakeholders. Components of a risk management plan should include the following points (We, 2020; Zwikael and Smyrk, 2019):

- Risk strategy. Overall plan for managing threats and opportunities. This often reflects the organization, the project, or stakeholders' risk culture and appetite and the risk exposure of the project.
- Approach. Methods, processes, and tools for identifying, analyzing, and responding to risks. It can also include the extent of planning and analysis, such as trigger point analysis, contingency planning, sensitivity analysis, and so on, to be applied on the project.
- Roles and responsibilities. Outline of who will lead, support, and coordinate risk management activities. Key risk owners are also identified and appointed. Risk owners are project stakeholders who are assigned to be the primary person responsible for overseeing and managing the assigned risks.
- Financial. Financial funding to buffer the project budget in the event of negative risks becoming a reality. As risks are "probabilities" that may not happen, securing sufficient funding can be difficult.
- Scheduling. Coordination of resources at the optimal time for identifying, evaluating, prioritizing, and responding to risks.
- Tools. How to capture risks and maintain an active register, what risk category to use, and how to track and record progress. In some organizations, risk audit is an important activity.
- Special. How to deal with risks that are not yet known, also called unknown–unknowns.

Today, especially in pandemic COVID-19 era, we often works in team projects in virtual environment (Stecula and Wolniak, 2022). It is very important to adjust the team and it's functioning to such situation. Project managers can leverage the strength and talents of multiple individuals that match the project plan, strategy and desired outcomes (Jonek-Kowalska and Wolniak, 2021, 2022; Jonek-Kowalska et al., 2022). Managing virtual team can be rewarding as well challenging. Virtualk Hires identified nine main guidelines that can be applied when selecting and managing individuals and teams in virtual environment (Virtual, 2014):

1. Perform a project evaluation. Project leaders must be knowledgeable about goals, tactics, and deliverables if they are to communicate effectively with prospective team members.
2. Determine the skill sets needed by team members. Match the skills of team members to the delegated tasks and mutually reach consensus on assignments. Leveraging individual strengths promotes measurable outcomes.
3. Identify and anticipate obstacles. Knowing what has been attempted previously to resolve a problem or opportunity can only benefit the present outcomes. Conversely, disregarding this information can mean a loss for the plan, as the strategy may actually require only a minor redesign or assignment of a team member with matching skills and competencies.

4. Constantly engage members and encourage bidirectional communication. Contact with virtual team members often is employed to verify needs for supervision and encouragement. Likewise, the team member can communicate successes and challenges encountered that require intervention.
5. Establish a timeline and milestones. Identify expectations and the schedule needed to move the project toward completion. Monitor progress at designated intervals. Share accomplishments with all virtual members and stakeholders.
6. Ensure individual team member accountability. Recognizing the importance of each individual member's investment in achieving the critical priorities of a specific project and their buy-in to the larger institutional performance is a critical success factor.
7. Be cognizant of cultural differences. Being aware and sensitive to the diversity of virtual team members is important to avoid conflicts and delays in completing assigned tasks.
8. Manage conflict and difficult team members. Avoiding a conflict will only perpetuate the issue and result in inefficiency of the individual and team function. Although crucial conversations may be difficult on a personal level, they are valuable for resolution of identified issues that may create project paralysis.
9. Provide education and training. Just-in-time or accelerated learning techniques may be required to assure all team members are on the same page with respect to the project goal and strategies. Using practical application examples and techniques matched with evidence, flexibility, and innovative teaching strategies can strengthen project outcomes and create synergy among virtual team members.

Effective governance of the virtual team is the key to success (Hąbek and Wolniak, 2013, 2016; Jonek-Kowalska and Wolniak, 2021; Hys and Wolniak, 2018). Bad prepared organizational management structure, overlapping roles, problems with decision-making can prevent a project from achieving success and valuable outcomes.

Projects are largely led and performed by people, and this means that the conflict between them is likely to be. This phenomenon can impact all projects professionals all over the world. In such a situation every project manager should have deep knowledge about conflict management (Martinelli and Milisevic, 2016). Project conflicts and their resolution have been found to have a high correlation with success. Conflicts have been found to deteriorate emotions and the general atmosphere of the project (Campbell, 2020; Denise, 2019). When conflicts are well managed, the benefits include greater team collaboration and discussion. Conflicts in projects can be categorized into some typical types which we characterized in take table 3.

Table 3.
Type of project conflicts

Conflict type	Characteristic
Conflicts over priorities	These are conflicts that occur over the sequence of activities and tasks, and it can occur at multiple levels – within project teams, between project teams, and with other groups.
Conflict over administrative procedures	These are conflicts over how the project is to be managed. This includes reporting relationships, roles and responsibilities, execution plan, and procedures for administrative support.
Conflict over technical options and performance trade-offs	In projects where technology is a consideration, conflicts may arise over technical issues, option analysis, performance specification, and trade-off decisions.
Conflict over manpower resources	These are staffing conflicts that can occur, especially on matrix organizations.
Conflict over cost	These are conflicts involving estimation of overall or parts of projects, allocation of budget to different parties, and willingness of different parties to share the cost.
Conflict over schedule	These conflicts involve timing, sequencing, and scheduling of project-related tasks.
Personality conflict	These are interpersonal conflicts that develop around personal differences rather on “technical” issues. These are typically emotion-based and when unresolved can spiral into major firestorms.

Source: (We, 2019).

Using project management in organization needs to use many tools and techniques adjusted to particular aspects of project management (Klastorin, 2004; Kerzner, 2015). In the table 4 we put main tools and technique using in project management dividing them into project area's (Gorod at al., 2020).

Table 4.
Division of project management tools and techniques according knowledge area's

Knowledge area	Tools and techniques
Integration management	Project selection, project methodology, project charters, stakeholder analysis, work authorization process
Scope management	Project scope statements, record documentation, scope change analysis
Time management	Pivot and pie charts, Gantt charts, project network diagrams, PERT, milestone evaluation, Critical path analysis
Quality management	Ishikawa diagrams, quality audits, quality control charts and procedures, six sigma, TQM
Cost management	Return on investment analysis, payback analysis, business cases, case studies, project portfolio management and control, cost estimation software, financial reports
Communication management	Communication plan, project web sites, status reports, relationship control
Human resource management	Motivation and productivity techniques, conflict management, responsibility matrices, team contracts, resource histogram, intellectual capital management
Risk management	Risk plan, probability/impact matrix risk ranking, Monte Carlo simulation

Source: (Bakator et al., 2017).

5. Conclusion

The publication concentrate on problems connected with various aspects of project management. The paper says about ISO and non ISO related projects trying to characterize and compare various types of standards and approaches. There is a special attention towards analysis of quality management in projects. Especially problems connected with risk in process which are important part of quality management and also play important role in ISO 9001 quality management standards. Paper also contains some analysis connected with the impact of COVID-19 pandemic on the project management and try to conclude main methods how to manage teams in project management in virtual environment.

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