

DOI:10.5937/IIZS25261H

QUALITY IN PROJECT MANAGEMENT AS A PIVOTAL PART IN THE CONSTRUCTION INDUSTRY

Dragan Hristovski¹

¹DS Smith, Skopje, North Macedonia

e-mail: vestak.hristovski@gmail.com

Abstract: Effective project management is a critical determinant of project success, encompassing the systematic planning, coordination, and control of resources to achieve predefined objectives. It plays a pivotal role in ensuring that projects are delivered within the constraints of time, budget, and scope, while adhering to specified quality standards. In construction industry projects, quality management is particularly crucial, as the durability and reliability of the final product must align with established performance standards. A comprehensive quality management plan is integral to effective project execution. It delineates the quality benchmarks for each project phase and outlines procedures for testing, inspection, and compliance. This process involves not only evaluating tangible outputs, such as equipment, technical drawings, or specifications, but also validating, verifying, and documenting quality assurance and control activities throughout the project lifecycle.

Key words: Quality, project management, construction, engineering

INTRODUCTION

The primary phases of a project encompass planning, feasibility analysis, design, procurement, construction, acceptance, operation, and maintenance. Quality represents a crucial determinant of success in construction industry projects, reliant upon rigorous quality management implemented consistently throughout the entire project lifecycle. Among these phases, design and construction exert the most significant influence on the ultimate quality outcomes. Furthermore, construction quality can be conceptualized as the fulfillment of stakeholder expectations, achieved by maximizing participant satisfaction. Failure to meet these expectations often results in defective construction, which can lead to frequent and costly errors impacting both contractors and facility owners. Consequently, quality management has emerged as a vital strategic competitive advantage for numerous construction firms, underpinning product development and sustaining long-term organizational success.

Project management constitutes an indispensable element within the construction sector, characterized by projects of considerable scale and complexity that demand meticulous planning and execution [8]. Within this context, project planning and scheduling are paramount, as they directly influence the timely, budget-compliant, and quality-assured delivery of projects. Systematic and structured planning and scheduling processes are essential for mitigating prevalent industry challenges such as delays and budget overruns. Given the inherent complexity and unique obstacles of construction projects, well established planning frameworks are necessary to efficiently allocate resources, manage timelines, and align stakeholder expectations [12].

MATERIAL AND METHODS

This research aims to highlight the impact of production processes and human behavior on construction projects, with a focus on quality as a key component of project management. By examining a wide range of sources, including normative texts and case studies, the research is situated within a broader scientific and operational context. Key concepts are examined through a review of selected scientific literature on Quality, Project management, and Lean Six Sigma, with a focus on how these areas align with sustainability principles, construction practices, and organizational management. This analysis provides a critical evaluation of their applicability, effectiveness and potential areas for improvement. Fundamental concepts, such as quality control, risk, and opportunity, are explored through document review and content

analysis. A combination of deductive and inductive approaches is used to classify and synthesize the theoretical foundations of the research.

Understanding of Quality in Project Management

Defining quality

The concept of "quality" is frequently encountered in daily life, often appearing in various forms of advertising. Phrases such as "top quality," "quality suppliers," "quality first," and "the place where quality matters" are commonly used to emphasize the perceived excellence of products or services. The term "quality" is almost universally associated with positive connotations, making it a highly desirable attribute for companies to align themselves with. In contemporary organizational contexts, establishing a connection with the notion of quality is considered essential. However, the precise definition of "quality" and the processes involved in attaining it remain subjects of ongoing debate.

The responsibility for ensuring quality primarily rests with organizational management and achieving quality outcomes necessitates both managerial awareness and appropriate training.

Juran's work on Planning for Quality emphasizes the principle that "quality does not happen by chance, it must be planned," highlighting the necessity of deliberate efforts in quality management. This perspective forms a core element of his "Quality Trilogy," which comprises Quality Planning, Quality Control, and Quality Improvement [10].

Quality Management Plan

The Quality Management Plan serves as the primary document guiding quality-related activities within a project and functions as one of several subsidiary management plans under the broader project plan. Given that quality management is often perceived as a complex or unfamiliar task, project managers may seek existing templates as a starting point. However, such templates are scarce, and the project management literature tends to offer descriptive overviews of quality management plans rather than concrete examples, although these descriptions can still offer valuable insights. Relying solely on templates may constrain the thoughtful consideration required to address the specific characteristics of individual projects. Consequently, it is recommended that project teams develop a customized Quality Management Plan that reflects the unique requirements and context of their project. In recent years, the importance of planning has increased, largely due to the growing adoption of project-based structures within companies and the integration of diverse project types into broader project portfolios. As a result, business managers who may have limited formal experience in project management are increasingly assuming the role of project managers. This shift heightens the significance of effective planning and results in greater reliance on planning functions to support project execution and oversight [4].

Requirements for Quality Control

During the formulation of a construction plan, the designer bears a critical responsibility to guarantee that all aspects of the project are cost effective, precise, thoroughly developed, well coordinated, rigorously reviewed, and fully finalized. To reliably fulfill the demands and expectations of the public, the pursuit of quality must be regarded with equal importance to adherence to schedule and budget constraints [3].

Quality Control

Monitoring involves the systematic evaluation of project outcomes to verify their compliance with established quality standards, as well as the identification of underlying causes of performance deficiencies to enable corrective measures. Contract documents serve as a precise, comprehensive, and accurate representation of the facility to be constructed, effectively conveying the owner's expectations concerning the facility's intended features and functional purpose.

Contract documents establish that the facility to be constructed complies with relevant regulatory codes and professional standards. This includes ensuring the facility's reliability, maintainability, material and system durability and strength, as well as the level of life safety afforded to its users [7]. Quality is defined as the degree to which a product conforms to the specifications and standards set by the construction firm. Quality control is the process by which the construction work is verified to meet prescribed performance and durability requirements. This process encompasses all stages, from material procurement to the completion of construction. Critical quality control activities conducted before and during construction include the assessment of soil conditions, review of drawings and design documents, verification of structural integrity and durability, evaluation of material quality and compliance with specifications, material testing, and equipment inspection. Quality control encompasses multiple dimensions, including the testing of materials before installation, conducting both field and laboratory evaluations, and ensuring that personnel possess sufficient knowledge of the appropriate construction methods, techniques, necessary precautions, and testing frequencies. A fundamental aspect of this process is the verification that all materials intended for use in the project conform to the specified requirements [9]. Quality control is broadly defined as a systematic approach aimed at sustaining a predetermined level of quality through the continuous monitoring of product or service attributes and the implementation of corrective measures when deviations from established standards occur. This domain can be categorized into three primary subfields: off-line quality control, statistical process control, and acceptance sampling plans [5].

Monitoring specific project results serves several important purposes:

- Primarily, it provides validation that the project is progressing as intended. When outcomes align with established specifications, the project team can be assured that work activities are being executed in accordance with the project plan.
- Project results also serve as a foundation for initiating corrective measures. When outcomes deviate from specified requirements, it signals that an issue has arisen, prompting the project team to implement appropriate corrective actions to address the discrepancy. Moreover, the team needs to investigate and identify the root cause of the nonconformity and implement preventive measures to mitigate the risk of recurrence.
- Project results function as critical feedback on the effectiveness of the quality assurance process. Data gathered through quality control measures is systematically evaluated during quality audits. When performance falls short of established specifications, it indicates that existing quality assurance activities are not fulfilling their intended purpose. Given that the fundamental goal of quality assurance is to ensure consistent adherence to defined standards, any performance gap necessitates a thorough analysis of the data to identify underlying deficiencies. The project team must then refine quality assurance practices and revise the quality assurance plan accordingly [11]. This continuous improvement approach aligns closely with the "Maintain" principle, which is inherently connected to the broader concept of sustainability [13].

Change control, encompassing a wide range of activities, may be fully or partially overseen by the Project and Programme Support Office (PPSO). Consequently, effective project management necessitates systematic coordination and control of key functions by the project management team [16].

Quality Improvement

Quality improvement is not just an idea, it is driven by a series of practical imperatives that require companies to continuously improve the quality of their products or services.

- The principal objective is to enhance product quality and minimize instances of nonconformity. By delivering superior products and reducing defects, companies can significantly improve customer satisfaction, which subsequently contributes to a stronger reputation and heightened competitive positioning in the market.
- Products do not exist in isolation,, they are developed to fulfill defined customer needs and expectations. A central motivation for pursuing quality improvement is to enhance the value

delivered to customers through superior products. Improved product quality not only fosters greater customer satisfaction but also has the potential to drive repeat business from existing clients and attract new customers, thereby contributing to company growth and market expansion.

- Enhanced processes lead to greater operational efficiency by optimizing time utilization, reducing waste, and minimizing the occurrence of nonconformities.
- Evolving customer demands and expectations necessitate a continuous commitment to improvement. Such pressure from customers should be regarded as a positive and constructive force, as it prevents organizational complacency. In the absence of this external impetus, there is a risk of stagnation, which can result in being outpaced or surpassed by competitors offering more innovative and superior solutions.
- Enhancing quality can lead to cost reductions by increasing operational efficiency and minimizing waste or defects. These cost savings can be strategically leveraged to improve competitiveness, either by enabling price reductions or by offering greater value through increased product or service output at existing price levels.
- Global competition is an enduring and inescapable reality of contemporary business. Virtually all products and services are exposed to international competitive pressures, often from regions where lower labor costs provide a distinct pricing advantage. In such contexts, enhancing product quality serves as a critical strategy for maintaining competitiveness, enabling firms to differentiate their offerings and remain viable in markets dominated by low cost producers.
- The rapid advancement of new technologies necessitates ongoing adaptation while simultaneously creating opportunities for quality enhancement. To remain competitive and responsive to market demands, companies must embrace continuous improvement. This ongoing process of change enables the consistent refinement of products and services, thereby delivering greater value to customers.

Quality improvement is essential to the long-term viability of a business. As outlined in the preceding discussion, failure to address any of the identified factors can critically undermine organizational performance and potentially lead to business failure [11].



Figure 1. Deming's PDCA circle [1]

Within the context of construction project management, quality management serves as a foundational pillar, frequently representing the decisive factor between organizational success and failure [1, 17].

Quality Assurance

Quality assurance encompasses a broad range of activities within project management, including the identification and mitigation of risks, the resolution of issues, and adherence to established quality standards and procedures. It may also entail comprehensive project audits, wherein all aspects of a project are systematically evaluated for compliance and effectiveness [4].

Failures in quality management frequently result in significant delays and cost overruns, disrupting projects that otherwise appear to be progressing well. Such crises often erode the anticipated advantages of the project, revealing underlying vulnerabilities in quality control systems [9].

Responsibility for quality does not reside with a single individual, rather, it is a collective obligation shared by all personnel involved, directly or indirectly, in the delivery of a product or service. Consequently, there is a critical need for a structured system that ensures strict adherence to all established procedures and plans. This is the foundational purpose of the quality assurance function [5].

Total Quality Management (TQM) is structured around three core pillars: the customer, internal processes, and the workforce. As depicted in Figure 2, the model is underpinned by the company's vision, mission, and the active commitment of its leadership. When employees lack a clear understanding of the strategic direction of the company, they may pursue personal or departmental objectives that conflict with overarching organizational goals, inadvertently undermining performance. For instance, prioritizing output volume without regard for cost efficiency or quality standards exemplifies such misalignment [5].

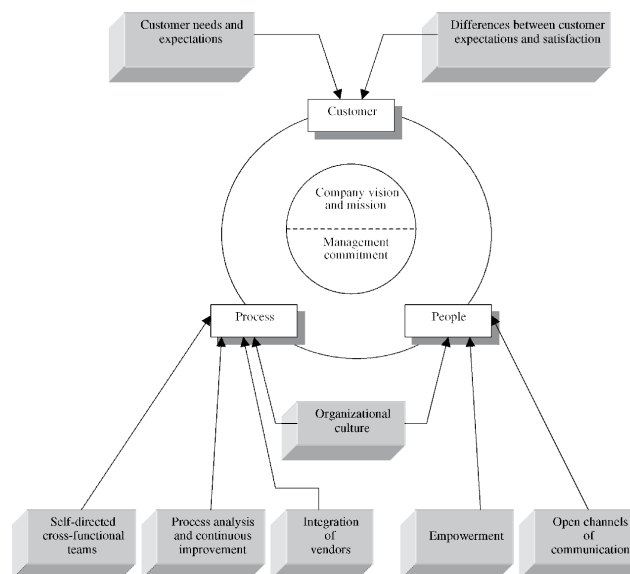


Figure 2: Features of a TQM model [5]

Risk management

Companies engaged in safety critical projects often adopt a rigorous approach to risk management, frequently employing dedicated risk management professionals whose primary responsibility is to support and oversee risk-related activities [4]. Risk management plays a pivotal role in project planning and scheduling due to the inherent and persistent uncertainties associated with construction projects. The systematic identification, analysis, and mitigation of risks are critical for minimizing potential disruptions and ensuring the continuity of project timelines [12].

Importance of Construction

A key determinant of construction quality is the accuracy, clarity, and completeness of the contract documents. Additionally, three other interrelated factors significantly impact construction outcomes: the competency of the workforce in executing specialized tasks, the presence of

experienced on-site supervisors who coordinate and oversee construction activities, and the quality and suitability of the materials employed in the building process [1]. Significant emphasis has been placed on the concept of Total Quality Management (TQM), a comprehensive organizational approach that necessitates collaborative effort across all hierarchical levels to enhance project quality and ensure optimal customer satisfaction. As a management philosophy, TQM is grounded in the principle of continuous process improvement, emphasizing the refinement of the systems and procedures involved in product development and delivery [1].

Lean Six Sigma Construction Principles

Lean principles are grounded in a systematic approach whereby companies identify and analyze all processes involved in converting raw materials into finished products in alignment with customer requirements. This analytical approach is commonly referred to as value stream mapping [13]. The concept of lean manufacturing was introduced in the 1980s by the International Automotive Project Group at the Massachusetts Institute of Technology, which examined innovative production strategies employed by Toyota in Japan. Since then, the notion of "lean thinking" has garnered considerable attention from both scholars and industry professionals [14]. In the context of construction, lean methodologies aim to enhance workflow efficiency, minimize non-value-adding activities, and improve overall project outcomes. The adoption of lean principles has been shown to result in substantial improvements in project performance, including reduced timelines and cost savings [12].

Companies that apply lean practices consistently seek to minimize the use of physical space, raw materials, water, energy, and equipment in their production processes [10]. Lean Six Sigma represents an integrated framework combining Lean Production and Six Sigma methodologies. It focuses on eliminating inefficiencies and non-value-added costs, minimizing process variation, and stabilizing the quality and performance of outputs, including those within the construction sector [15]. Quality management plans serve both internal and external functions for construction firms. They provide a structured means of ensuring compliance with predefined standards and regulatory requirements, thereby supporting the delivery of work that is both legally compliant and practically executable [2]. The variables that play a role in the successful implementation of a project are the risk of nonconformity of the construction, the complexity of the construction and the severity [6].

RESULTS AND DISCUSSION

Quality is commonly understood to be the extent to which a company fulfills the needs and expectations of its customers. The development, implementation, and continual enhancement of a quality management system (QMS) are critical to achieving this objective. An effectively designed and properly executed QMS ensures consistent delivery of products and services that conform to customer requirements. Beyond direct quality assurance, the implementation of a QMS yields significant indirect advantages, particularly in terms of cost efficiency. By minimizing the occurrence of nonconformities, such as defective products or rework resulting from unmet specifications, a QMS reduces waste, prevents operational delays, and promotes optimal time management. Overall, the systematic adoption of QMS is indispensable for organizational growth. It not only supports customer satisfaction but also contributes to enhanced operational performance and strengthens corporate reputation [3]. Quality assurance in construction projects requires focused and ongoing attention. The successful implementation of project activities relies heavily on having a skilled and competent workforce. Inadequate training among workers consistently results in subpar outcomes, as quality cannot be achieved without the necessary technical skills. Therefore, it is crucial to prioritize continuous professional development for both workers and supervisory staff through regular, targeted training programs designed to improve their operational abilities. This focus on training should also include supervisors and engineers, whose roles are vital in maintaining quality standards throughout the project lifespan. Ultimately, delivering high quality results in construction demands careful attention to all aspects of project management, including human resource development and capacity building.

CONCLUSION

Quality in project management is a fundamental pillar of success in the construction industry. It ensures that projects comply with technical specifications, meet client expectations, adhere to regulatory standards, and deliver long term performance, safety, durability, and functionality. Embedding quality management principles across all project phases, from planning and design to execution and handover, enhances efficiency, safety, sustainability, and client satisfaction.

Neglecting quality can result in costly rework, legal disputes, and reputational harm. In contrast, a strong focus on quality builds trust, adds value, and supports continuous improvement. In an industry as competitive and complex as construction, a commitment to quality is not optional, it is essential for delivering excellence and achieving long term success. By maintaining a quality first approach throughout the project lifecycle, risks are minimized, costs are reduced, and a reputation for excellence is established. In a field where trust and performance are critical, quality is not merely an added benefit, it is a strategic necessity for sustainability and lasting achievement.

REFERENCES

- [1] Oberlender, G. D. (2000). *Project management for engineering and construction*. McGraw-Hill Higher Education, United States.
- [2] Lester, A. (2006). *Project management: Planning and control*. Elsevier Science & Technology Books, United States.
- [3] Rumane, A. R. (2017). *Quality management in construction projects*. CRC Press, Taylor & Francis Group, Boca Raton, FL.
- [4] Cadle, J., & Yeates, D. (2008). *Project management for information systems* (5th ed.). Pearson Education Limited, Harlow, England.
- [5] Mitra, A. (2016). *Fundamentals of quality control and improvement* (4th ed.). John Wiley & Sons, Hoboken, NJ.
- [6] Meijer, F., & Visscher, H. (2017). Quality control of constructions: European trends and developments. *International Journal of Law in the Built Environment*, [https://DOI: 10.1108/IJLBE-02-2017-0003](https://doi.org/10.1108/IJLBE-02-2017-0003).
- [7] Bhattacharjee, J. (2018). Quality control and quality assurance in building construction. *International Research Journal of Management Science & Technology (IRJMST)*, ISSN 2250–1959.
- [8] Mallawaarachchi, H., & Senaratne, S. (2015). Best practices in project planning: Insights from the Sri Lankan construction industry. In *Proceedings of the 6th International Conference on Structural Engineering and Construction Management*, Kandy, Sri Lanka.
- [9] Salvi, S. S., & Kerkar, S. S. (2020). Quality assurance and quality control for project effectiveness in construction and management. *International Journal of Engineering Research & Technology (IJERT)*, ISSN 2278–0181.
- [10] Watson, P., & Howarth, T. (2011). *Construction quality management: Principles and practice*. Spon Press, Abingdon, Oxon.
- [11] Rose, K. H. (2005). *Project quality management: Why, what and how*. J. Ross Publishing, Boca Raton, FL.
- [12] Oluwatosin, E. A. (2024). Best practices for efficient project planning and scheduling in construction management. *International Journal of Research Publication and Reviews*.
- [13] Puvanavarman, P., Kerk, R. S. T., & Vasu, S. A/L. (2014). Lean environmental management integration system for sustainability of ISO 14001:2004 standard implementation. *Journal of Industrial Engineering and Management*, 7(1), 134–157. <https://doi.org/10.3926/jiem.907>
- [14] Jingkuang, L., & Guangsheng, S. (2017). Quality Control of a Complex Lean Construction Project Based on KanBIM Technology, *Journal of Mathematics Science and Technology Education*, DOI: 10.12973/eurasia.2017.01039a.

- [15] Linde, I., & Philippov, D. (2020). Applying Lean Six Sigma in Construction. World Practice Experience, ACCESS Journal: Access to Science, Business, Innovation in Digital Economy, [https://doi.org/10.46656/access.2020.1.2\(2\)](https://doi.org/10.46656/access.2020.1.2(2)).
- [16] Herath, S., & Chong, S. C. (2021). Key components and critical success factors for project management success: A literature review. Operations and Supply Chain Management: An International Journal, 14(4), 487–498. <https://doi.org/10.31387/oscm0470314>
- [17] Pascal, D. (2015). Lean Production Simplified: A Plain-Language Guide to the World's Most Powerful Production System, CRC Press, Taylor & Francis Group, Boca Raton, Florida