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THE ROLE OF QUALITY MANAGEMENT IN THE CONSTRUCTION SECTOR: ANALYSIS AND APPLICATION IN THE CONTEXT OF AZERBAIJAN

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Introduction. The construction sector is one of the key components of the economic system in both developing and developed countries. In Azerbaijan, the strategic importance of this sector within the national economy is primarily linked to the production and application of high-quality construction materials. Factors such as product quality, production costs, the adoption of technological innovations, energy efficiency, and scientific-technical substantiation play a crucial role in shaping the sector [5]. This field is not limited solely to the construction of buildings and infrastructure, it also significantly contributes to the enhancement of social welfare, employment growth, and broader economic development.

In the context of Azerbaijan, the construction sector plays a vital role in stimulating economic activity and advancing the government's long-term development strategies. However, the efficient and purposeful implementation of construction projects is not confined to compliance with technical and legal requirements alone, the integration of quality management systems is equally decisive for sectoral progress. Quality management encompasses all stages of the construction process-from planning to execution and monitoring-and ensures that predefined quality standards are consistently upheld [1], [2]. This approach not only improves the technical quality of projects but also ensures their cost-effective and timely completion in accordance with pre-established financial and scheduling frameworks, while fully meeting client expectations. One of the main advantages of this model is its ability to reduce economic risks in the construction sector and enhance overall operational productivity.

Analysis of recent research and publications. Today, a number of important studies have been conducted on quality management in the construction sector, both in Azerbaijan and internationally. Among them, the studies of E. Yusifov, A. Sarkarli, V. Byba, I. Milenko, A. Paveliva, T. Kushnirova, H. Kezner, J. Juran, A. Godfrey and others on quality management in the construction sector can be cited.

The purpose of the work is to analyze and justify quality management and economic approaches in the construction sector in Azerbaijan.

The main material of the study. Since the year 2000, Azerbaijan's construction sector has undergone substantial development, reflecting its growing strategic importance within the national economy. The construction sector is not only an important driving force of economic growth, but also occupies a leading position in the national development strategy of the Republic of Azerbaijan in terms of expanding sustainable employment opportunities. According to analytical data of the State Statistical Committee of the Republic of Azerbaijan for recent years, the number of economic entities operating in this field demonstrates systematic growth dynamics, and the sector's share in the Gross Domestic Product (GDP) is increasing steadily every year. Large-scale construction projects implemented in Baku and other large industrial-urbanization centers,

in particular, – multi-storey residential complexes, modern commercial infrastructure, transport arteries and public facilities – act as practical manifestations of the national urbanization concept. However, against the background of rapid development rates, a number of structural problems and institutional inconsistencies are also evident in the sector. One of the most serious challenges is the lack of widespread application of internationally accepted quality management systems in the construction sector. For example, the limited level of application of certified management standards such as ISO 9001 and ISO 14001 in the sector can directly negatively affect the sustainability and safety level of projects. The sometimes formal approach to the local regulatory and legal framework at the design, implementation and operation stages, and the inadequate application of technical standards and ethical principles, especially by representatives of the private sector, reveal the institutional weakness of the sector. Systematic monitoring conducted by the Ministry of Emergency Situations of the Republic of Azerbaijan shows that a certain part of existing construction facilities does not meet the applicable urban planning norms and technical safety requirements. Violations detected in the field of fire safety, lack of systematization in the preparation of technical conditions and failure to take into account seismic stability indicators are directly assessed as a threat to public safety and sustainable development criteria. The analytical reports of the Ministry emphasize that the only formal nature of the expertise and control procedures carried out in a number of projects may create serious socio-economic risks in the future and may have a negative impact on the investment climate. At the same time, it is obvious that the sector also needs to be improved in terms of human capital. Currently, a significant part of technical specialists operating in the construction sector do not have the necessary specialization in the application of modern technologies. The realization of innovative potential is delayed because new generation construction approaches – such as Digital Building Information Modeling (BIM), the use of energy-efficient building materials and agile design methodologies – are not widely applied in the real sector. Although state-level training and professional development programs are being implemented in this direction, these initiatives are not able to fully meet the emerging demand in the sector. In terms of the regulatory and legal framework, although the existing legislative acts in the field, including the "Urban Planning and Construction Code" and the Law "On Construction Activities", determine the general mechanism of action, in some cases there is a lack of flexibility and effectiveness in their application and implementation mechanisms. This also acts as one of the factors limiting the efficiency of projects and investment flows. Increasing transparency in management, reducing bureaucratic procedures, as well as modernizing control and administrative models based on digital technologies can significantly strengthen the institutional stability of the sector. In this context, it should be noted that the construction sector in the Republic of Azerbaijan has a special weight in the macroeconomic development trajectory of the country, being of strategic importance in the formation of economic security and social infrastructure. Large-scale infrastructure projects and urban development initiatives implemented over the past decades have led to an increase in certain quality indicators in the sector. However, in order to ensure the long-term impact of these achievements, it is necessary to deepen structural reforms, implement more stringent safety and quality criteria, form human capital in line with technological innovations, and strengthen public-private partnerships. Integrated management models built on the principles of digitalization, sustainability, and transparency can enable the construction sector in Azerbaijan to become an internationally competitive system in the future.

Despite the existence of regulatory frameworks governing construction activities, practical application often deviates from prescribed standards, resulting in inefficiencies and diminished project performance. One of the most prevalent issues observed in construction projects is the frequent overrunning of budgetary allocations, underscoring deficiencies in both planning and quality oversight mechanisms. The absence of a robust quality monitoring infrastructure has occasionally led to the substandard utilization of resources and labor, failing to meet the rigorous quality benchmarks essential for sustainable construction practices. By contrast, global best practices emphasize that quality-centered management frameworks are integral to optimizing financial resource allocation and enhancing production efficiency throughout the project lifecycle. In Azerbaijan, the number of construction firms certified under internationally recognized quality standards remains relatively limited. For instance, only 57 companies obtained ISO 9001:2015 certification between 2022 and 2023 [7], indicating gradual but cautious progress in standardization efforts. The construction sector continues to serve as a vital pillar of the national economy, contributing consistently to the country's GDP. Although the sector's GDP share exhibits fluctuations across different time periods, an overall positive growth trajectory is evident [8].

Capital investment directed toward construction works in Azerbaijan represents a crucial element of the country's socio-economic strategy, mirroring ongoing infrastructural modeling and expansion initiatives.

This study examines statistical data spanning 2013 to 2023 to analyze the annual dynamics, growth rates, and structural share of investments allocated to construction activities. The generated analytical framework (Figure 1.) facilitates a comprehensive understanding of sectoral transformations and provides a conceptual foundation for assessing the efficacy of economic policies related to construction within the national economic system [6], [8].

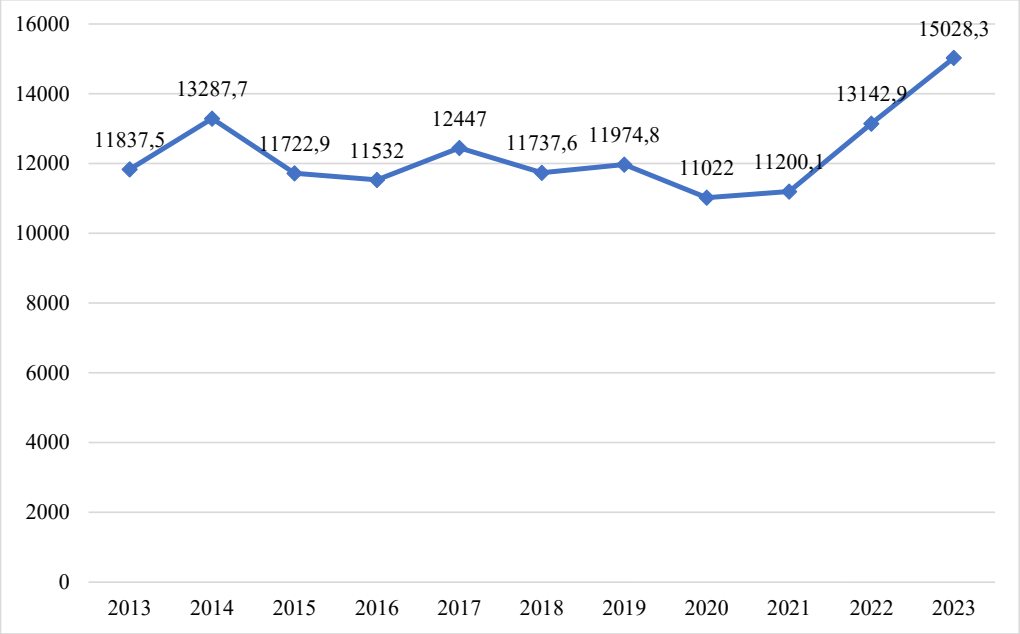

Figure 1. Invesment expenditures in construction works in Azerbaijan, mln. manats

Source: compiled by the authors according to [6; 8]

From 2013 to 2023, investments in construction and installation works consistently represented a dominant share-ranging from approximately 50% to 75%-of Azerbaijan's total capital expenditures. For instance, capital allocation rose from 11.8 billion manats in 2013 to over 15 billion manats by 2023. This stable investment stream highlights the sector's enduring priority within national economic planning. Beyond physical expansion, these allocations have also enabled technological advancement and increased operational efficiency. Public-private partnerships, in particular, have proven instrumental in expanding project scale and ensuring adherence to international quality benchmarks. Such coordinated efforts are essential to strengthening the sector's global competitiveness and sustaining long-term national development.

The successful execution of construction projects fundamentally relies not only on technical quality but also on economic efficiency [1]. From this perspective, quality management occupies a pivotal role, not merely in production processes but in shaping the strategic direction of the entire project. Adherence to national and international regulatory standards throughout construction processes minimizes material wastage and reduces the need for rework and supplementary tasks, thereby enabling more accurate and cost-effective project budget control. Effective planning and phased implementation ensure the project progresses according to the established schedule, preventing time delays and associated additional financial expenditures [2]. The early identification and prompt mitigation of potential risks significantly contribute to minimizing financial losses and optimizing budget management [3]. Ensuring high-quality standards in projects enhances client satisfaction and trust, laying a robust foundation for future collaborations and contributing to sustained long-term economic profitability. Moreover, strict compliance with prevailing legal requirements and technical norms in construction mitigates potential legal issues and helps avoid penalties and extra restoration costs. Thus, the effective management of quality bears strategic importance in elevating the technical performance of construction projects while ensuring financial prudence.

Figure 2. presents key macroeconomic indicators of Azerbaijan's construction sector for the period 2013–2023, reflecting the impact of quality management on economic efficiency and the sector's steady developmental dynamics [6]. Internationally, the implementation of construction and infrastructure projects is

recognized as a primary stimulus for revitalizing national economies and reinforcing macroeconomic stability. In particular, projects related to the expansion of transportation networks, modernization of the energy sector, and adoption of renewable energy resources introduce new dynamics into the economic system, establishing a foundation for long-term structural development [4].

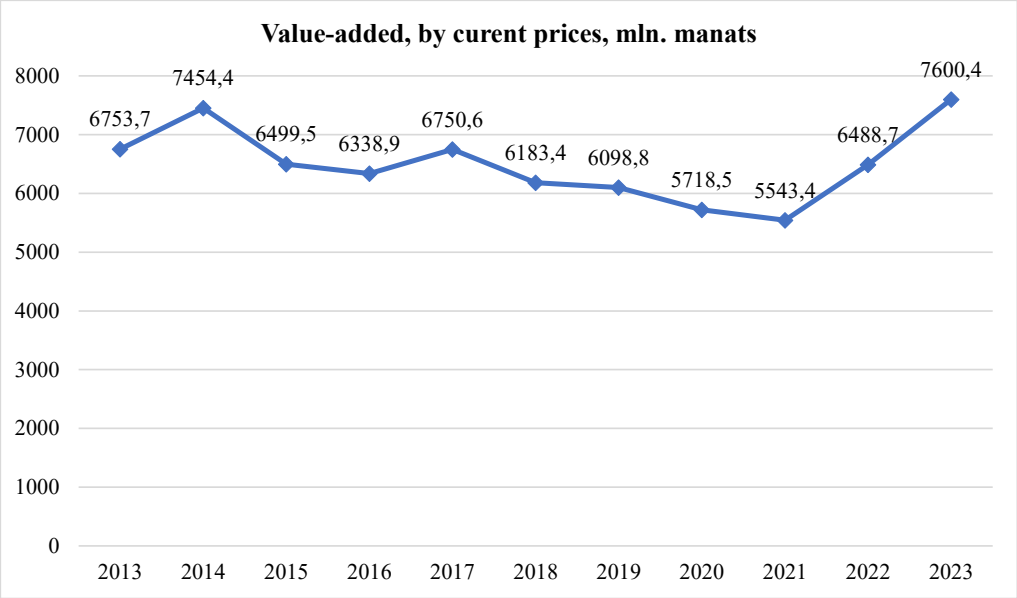

Figure 2. Macro-economic indicators of comstruction enterprises in Azerbaijan

Source: compiled by the authors according to [6]

Between 2013 and 2023, the added value generated by Azerbaijan's construction sector showed a dynamic trend, increasing from 6,753.7 million manats in 2013 to 7,600.4 million manats in 2023. Despite periods of decline-particularly during 2015-2020-this trajectory ultimately reflected the sector's capacity for recovery and adaptation. Key drivers of this growth include the integration of quality management systems, strict adherence to international standards, and proactive risk mitigation strategies. These practices have improved efficiency, reduced technical errors, and reinforced economic performance. In particular, efficient and effective quality management, full compliance with applicable regulatory and legal requirements, as well as timely identification and prevention of potential technical and engineering risks during project implementation are among the main factors that form the basis of this rise. Given the complex nature of the construction sector and its various technical components, quality control mechanisms are not only focused on the technical implementation of specific projects, but have had a significant impact on the institutional sustainability and economic stability of the sector as a whole. In this context, it should be noted that in modern times, quality control does not only perform the function of checking technical processes and monitoring implementation mechanisms. It has also become a multifaceted management tool that ensures the long-term sustainability of the socio-economic results of projects. The systematic application of quality standards has both increased the functional reliability of construction facilities and created conditions for the sector to comply with international technical indicators. At the same time, internal audits on quality management, certification procedures and the application of modern technologies act as one of the fundamental structural supports in the process of transformation of the sector. Consequently, the construction sector has strengthened its role in national development, evolving into a strategically significant component of Azerbaijan's macroeconomic structure [6].

PMD Projects LLC, one of Azerbaijan's leading construction and project management companies, approaches quality management not merely as compliance with technical standards but as an integral part of its corporate values and strategic objectives [11]. The company places strong emphasis on integrating health, safety, and environmental (HSE) principles comprehensively into the planning and execution phases of projects, thereby ensuring adherence to high-quality standards [8]. This approach is distinguished by its responsible conduct in protecting workforce welfare, maintaining ecological balance, and safeguarding public interests. The quality management system implemented by PMD Projects fully complies with the requirements of the international

ISO 9001:2015 standard, enabling transparent, efficient, and systematic control throughout all project stages. Within this framework, strict oversight mechanisms are employed to optimize resource use, minimize material wastage, and reduce rework, which collectively ensure projects are completed on schedule and within budget. Early identification and mitigation of risks also constitute a vital component of this management approach. The company rigorously adheres to legal and regulatory requirements, clearly delineates responsibilities among staff, and enhances the effectiveness of the management system through continuous expert supervision. Regular internal audits and performance evaluations conducted by PMD Projects support ongoing development and improvement efforts. This strategic approach has contributed to the company's international recognition. For instance, the "Hilton Garden Inn" project received the GPM360 certification for environmental sustainability and was lauded as a model initiative. In 2020, PMD Projects was awarded by the "World Commerce & Contracting" organization for excellence in commercial and contract management. Additionally, the "Agdam Residence" and "AFEZ" projects were honored with the "Green Business Award" in 2023 at the Caspian Water Innovation Forum for efficient water resource utilization and ecological sustainability. In energy management, the company's practices are certified under ISO 50001:2022, demonstrating responsible resource usage and improved energy performance [10]. Quality standards applied across major projects such as "Zafar Park," "Hilton Garden Inn Baku," "Agdam Residence," "Zefir Mall," and "Sharq Bazaar" extend beyond technical criteria to emphasize safety and environmental sustainability principles [10]. In conclusion, the quality management practices of PMD Projects LLC exemplify a comprehensive and integrative approach encompassing technical, social, and economic dimensions within the construction sector. This model plays a significant role in fostering a culture of quality in Azerbaijan's industry.

Conclusions. Quality management plays a vital strategic role in the development of Azerbaijan's construction sector, both in terms of economic advancement and the successful execution of projects. Analytical findings indicate that adherence to quality standards, combined with the efficient application of planning and control mechanisms, significantly enhances not only the technical quality of construction projects but also their economic performance. Increased investment, the ability to complete projects within designated timeframes and budgets, improved client satisfaction, and the mitigation of legal risks are all key drivers of sustainable growth in the sector. The case of PMD Projects LLC illustrates that quality management extends beyond fulfilling technical requirements; it necessitates a comprehensive approach that integrates principles of social responsibility and environmental sustainability. This integrative model not only ensures the successful delivery of construction projects but also strengthens competitive advantage and contributes to international recognition. Ultimately, the effective management of quality in Azerbaijan's construction sector serves to enhance economic efficiency while promoting long-term social and ecological resilience. For this reason, the advancement and widespread implementation of robust quality management systems should be considered a strategic priority within the country's broader framework for sustainable development.

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Elshad Yusifov, PhD (Economics), Associate Professor, Azerbaijan University of Architecture and Construction. **Osman Rzayev,** Master Student, Azerbaijan University of Architecture and Construction. **The role of quality management in the construction sector: analysis and application in the context of Azerbaijan.**

This article explores the economic importance of quality management within Azerbaijan's construction sector, alongside the current methodologies employed in the sector. Achieving success in modern construction projects goes beyond mere technical execution; it fundamentally depends on efficient resource utilization, reduction of material wastage, and ensuring projects are completed on schedule and within budget. Meeting these goals requires the implementation of systematic and well-structured quality management practices. The study analyzes investment patterns in the construction sector over a specific timeframe, revealing a 50–75% growth in investments since 2000, which has enabled the adoption of advanced technologies and globally recognized quality management frameworks. The results highlight the vital role these systems play in strengthening the financial resilience of construction companies, optimizing resource allocation, mitigating risks, enhancing customer satisfaction, and facilitating the successful delivery of future projects. The example of PMD Projects LLC, a subsidiary of the prominent Azerbaijani construction company PMD Group LLC, demonstrates that adherence to international standards like ISO 9001:2015 significantly contributes to operational excellence and helps cultivate a positive investment environment. This strategy encompasses not only technical quality but also emphasizes social responsibility and environmental sustainability. Ultimately, the article contends that embedding quality-driven management practices in the construction sector should be considered a strategic element in Azerbaijan's economic growth strategy, calling for ongoing adoption of comprehensive and institutionalized quality frameworks.

Key words: Azerbaijan, construction sector, quality management, investment, resource optimization.

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У статті досліджується економічне значення управління якістю у будівельній галузі Азербайджану, а також сучасні підходи, що впроваджуються у цьому секторі в умовах інтеграції країни у глобальний економічний простір. Підкреслюється, що успішна реалізація будівельних проєктів сьогодні виходить за межі технічного виконання й потребує комплексного підходу, що поєднує ефективне використання фінансових, трудових і матеріальних ресурсів, зменшення втрат будівельних матеріалів, суворе дотримання строків та раціональне використання бюджетів. Досягнення таких результатів вимагає системного й цілеспрямованого впровадження інструментів управління якістю, які забезпечують сталість бізнес-процесів та конкурентоспроможність компаній. У дослідженні проаналізовано динаміку інвестицій у будівельну сферу з початку 2000-х років, яка засвідчила зростання обсягів капіталовкладень на 50–75%. Це створило передумови для масштабного впровадження сучасних технологій, цифрових рішень та міжнародно визнаних систем менеджменту якості, що відповідають принципам ISO. Результати дослідження підкреслюють ключову роль цих систем у зміцненні фінансової стійкості підприємств, оптимізації планування ресурсів, зниженні виробничих та управлінських ризиків, підвищенні рівня довіри інвесторів і задоволеності замовників, а також у забезпеченні передбачуваності й прозорості майбутніх проєктів. На прикладі компанії PMD Projects LLC, дочірнього підприємства провідної будівельної групи PMD Group LLC, продемонстровано, що дотримання міжнародних стандартів управління якістю, зокрема ISO 9001:2015, є визначальним чинником зростання операційної ефективності, формування сприятливого інвестиційного клімату та підвищення рівня корпоративної соціальної відповідальності. Зазначено, що сучасне управління якістю у будівельній сфері охоплює не лише технічний контроль, а й екологічну стійкість, безпекові аспекти та соціально-економічну відповідальність бізнесу перед суспільством. У підсумку стверджується, що розвиток якісного менеджменту має розглядатися як один із стратегічних пріоритетів економічної політики Азербайджану, що вимагає безперервного вдосконалення інституційного середовища, впровадження інноваційних практик та створення комплексних програм підтримки будівельних компаній на основі принципів якості, прозорості та сталого розвитку.

Ключові слова: Азербайджан, будівельний сектор, управління якістю, інвестиції, оптимізація ресурсів.