

## Article

# Improving Economic Efficiency in Construction Material Manufacturing Enterprises Through Integrated Assessment and Benchmarking: Evidence From Uzbekistan

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**Abstract.** The purpose of this study is to develop a multi-factor integrated approach for the comprehensive assessment and improvement of economic efficiency in construction material manufacturing enterprises. The empirical analysis is based on the financial and production indicators of two private enterprises operating in Uzbekistan's construction materials industry, "Qarshi Benefit" and "Inter Mega Biznes," covering the period from 2021 to 2025. The scientific novelty of the study lies in the development of a comprehensive methodology for assessing the economic efficiency of construction material manufacturing enterprises, the integration of benchmarking and econometric forecasting into a unified management framework, and the empirical substantiation of its practical effectiveness using enterprise-level data. The findings may contribute to improving resource utilization efficiency, optimizing production costs, and strengthening the competitiveness of industrial enterprises.

**Keywords:** economic efficiency, benchmarking, integrated index, construction materials industry, industrial enterprise, resource efficiency, econometric model, forecasting.

## Introduction

In the global economy, industrial enterprises are among the key drivers of economic growth, high value-added creation, and national competitiveness. According to the United Nations Industrial Development Organization (UNIDO), industrial sectors accounted for 20.9% of global gross domestic product (GDP) in 2024, of which 78.7% was attributable to manufacturing. These figures demonstrate that improving efficiency in manufacturing enterprises is an important factor not only for the performance of individual enterprises but also for ensuring the sustainable development of national economies [1].

The construction materials industry represents one of the strategic segments of the manufacturing sector and has been developing rapidly due to accelerating urbanization, expanding infrastructure projects, and increasing investment activity. Given its close interconnection with numerous sectors of the economy, improvements in the efficiency of the construction materials industry generate multiplier effects across construction, transportation, logistics, and service industries. At the same time, rising energy prices,

volatility in raw material costs, and increasingly stringent environmental requirements have intensified the need for enterprises to optimize production costs and ensure the rational use of resources.

The construction materials industry is also considered one of the priority sectors of the Uzbek economy. In recent years, the commissioning of new production capacities, increasing investment volumes, and the expansion of export markets have significantly accelerated the development of the industry. By the end of 2025, production, investment, and export volumes in the construction materials industry had reached record levels [2]. At the same time, practical evidence indicates that an increase in production volumes does not always lead to a proportional improvement in economic efficiency. At some enterprises, high production costs, increased consumption of resources and energy, inefficient utilization of fixed assets, and disparities in labor productivity negatively affect economic performance. Therefore, assessing economic efficiency solely on the basis of profit or profitability indicators is insufficient to meet contemporary management requirements.

A review of the scientific literature indicates that most studies on economic efficiency assessment examine financial indicators, production productivity, or resource utilization as separate dimensions. However, insufficient attention has been paid to integrating financial, production, and resource-related factors into a unified assessment framework for construction material manufacturing enterprises, developing managerial decisions through inter-enterprise benchmarking, and applying econometric forecasting to economic efficiency. This research gap determines the relevance and significance of the present study. The purpose of this study is to develop a multi-factor integrated model for assessing economic efficiency in construction material manufacturing enterprises in Uzbekistan, propose a benchmarking-based mechanism for improving efficiency, and enhance managerial decision-making through an econometric assessment of the key factors affecting economic efficiency.

#### **Literature Review**

The assessment of economic efficiency has been examined from various perspectives by international, CIS, and Uzbek scholars. Their scientific contributions provide an important theoretical foundation for the development of methodologies for evaluating economic efficiency.

Among international scholars, M. Porter explained enterprise economic efficiency through the Value Chain concept and emphasized the importance of cost optimization and the improvement of value-creating activities in achieving competitive advantage. R. Kaplan and D. Norton, through the Balanced Scorecard concept, argued that economic efficiency should be assessed not only through financial indicators but also in conjunction with internal business processes, customer-related indicators, and innovation and development measures. J. P. Womack and D. T. Jones, within the Lean Manufacturing concept, demonstrated that optimizing production processes, reducing waste, and improving resource utilization are key factors in enhancing enterprise efficiency. Among CIS scholars, S. Yu. Glazyev associated the sustainable development of industrial enterprises with innovation and institutional factors. A. G. Aganbegyan identified investment and labor productivity as major determinants of production efficiency. A. I. Tatarkin, in turn, provided a scientific rationale for the impact of rational resource utilization and regional development factors on the economic efficiency of industrial enterprises.

Among Uzbek scholars, M. A. Ikramov investigated the theoretical and practical aspects of improving economic efficiency in industrial enterprises. A. U. Burkhanov developed scientific recommendations for improving methods of assessing investment and production efficiency at the enterprise level. S. S. Salomova examined the economic mechanisms for ensuring the sustainable development of industrial enterprises, improving resource utilization efficiency, and strengthening competitiveness. The literature review indicates that, although previous studies have extensively examined individual dimensions of economic efficiency, insufficient attention has been paid to assessing financial, production, and resource-related factors in construction material manufacturing enterprises through a unified multi-factor integrated index, combining this assessment with a benchmarking mechanism, and applying econometric forecasting. The present study is specifically aimed at addressing this research gap.

### Materials and Methods

The objects of this study were “Qarshi Benefit” and “Inter Mega Biznes,” two private enterprises operating in the construction materials manufacturing sector of Uzbekistan. The empirical basis of the study consisted of the enterprises’ financial statements, production indicators, resource utilization data for 2021–2025, as well as official statistical information.

In addition, data from the National Statistics Committee of the Republic of Uzbekistan, the Ministry of Construction, the “O’zsanoatqurilishmateriallari” Association, and international organizations, including UNIDO, the World Bank, and the OECD, were used. These data made it possible to identify development trends in the construction materials industry and to compare enterprise performance with national and international indicators. To achieve the objectives of the study, a comprehensive set of modern economic analysis methods was applied. These included:

- comparative analysis — to compare the performance of the selected enterprises;
- economic and statistical analysis — to assess the dynamics of key indicators;
- benchmarking — to identify and adapt best practices of better-performing enterprises;
- integrated index method — to combine financial, production, and resource indicators within a unified assessment framework;
- correlation and regression analysis — to identify the factors affecting economic efficiency;
- econometric forecasting — to assess development trends through 2030.

The integration of these methods enabled a comprehensive assessment of enterprise performance and the development of scientifically grounded conclusions and recommendations aimed at improving economic efficiency.

The study was conducted through the following sequential stages:

- Stage 1 – analysis of the scientific literature and theoretical approaches;
- Stage 2 – collection and systematization of data on the selected enterprises;
- Stage 3 – calculation of financial, production, and resource efficiency indicators;
- Stage 4 – construction of a multi-factor integrated economic efficiency index;
- Stage 5 – benchmarking-based comparison of enterprise performance;
- Stage 6 – econometric modelling of the factors affecting economic efficiency;
- Stage 7 – preparation of forecasts through 2030 and development of practical recommendations.

In this study, economic efficiency was assessed on the basis of three interrelated components:

- Financial factors — revenue, profit, return on assets (ROA), and return on equity (ROE);
- Production factors — production output, labor productivity, and production costs;
- Resource factors — efficiency in the utilization of raw materials, energy, and other production resources.

These factors were aggregated into an integrated index, compared using a benchmarking mechanism, and their effects on economic efficiency were assessed through an econometric model.

### Results and Discussion

The construction materials industry is one of the strategic segments of global manufacturing and is directly linked to the development of infrastructure projects, residential construction, and industrial facilities. In recent years, the economic significance of this industry has increased considerably due to accelerating urbanization, growing investment activity, and the widespread adoption of modern construction technologies. At the same time, fluctuations in energy prices, rising raw material costs, and the need to reduce production costs require enterprises to improve mechanisms for the comprehensive assessment and management of economic efficiency.

In Uzbekistan, the construction materials industry has also demonstrated consistent growth in recent years and has become an important sector of the national economy through the commissioning of new production capacities, implementation of investment projects, and expansion of export potential. However, alongside increasing production volumes, issues related to efficient resource utilization, production cost management, and strengthening enterprise competitiveness remain highly relevant. Therefore, analyzing the development trends of the industry represents an important stage in assessing the economic efficiency of construction material manufacturing enterprises.

To assess the overall development trends of the construction materials industry, it is important to examine changes in market size, investment activity, industrial production, and construction costs. Table 1 presents the key global development indicators of the construction materials industry for 2021–2025.

**Table 1. Global Development Indicators of the Construction Materials Industry (2021–2025) [14]**

| Indicators                                         | 2021   | 2022   | 2023   | 2024   | 2025   |
|----------------------------------------------------|--------|--------|--------|--------|--------|
| Global construction materials market (USD billion) | 1245,6 | 1286,9 | 1331,5 | 1377,2 | 1422,3 |
| Annual market growth (%)                           | 3,1    | 3,3    | 3,5    | 3,4    | 3,3    |
| Asia-Pacific market share (%)                      | 47,2   | 47,6   | 48,0   | 48,5   | 48,8   |
| Infrastructure investment (USD trillion)           | 2,60   | 2,74   | 2,89   | 3,05   | 3,22   |
| Industrial production index (2021=100)             | 100,0  | 103,4  | 106,1  | 109,3  | 112,5  |
| Construction cost index (2021=100)                 | 100,0  | 111,8  | 118,7  | 121,3  | 123,6  |

As shown in Table 1, the global construction materials market increased from USD 1,245.6 billion in 2021 to USD 1,422.3 billion in 2025, indicating steady growth over the analyzed period. Infrastructure investment also rose from USD 2.60 trillion to USD 3.22 trillion, while the industrial production index reached 112.5 in 2025. At the same time, the construction cost index increased to 123.6, reflecting growing cost pressures on producers. The Asia-Pacific region strengthened its position in the global market, with its share increasing from 47.2% to 48.8%. These trends highlight the growing importance of improving resource utilization, controlling production costs, and enhancing economic efficiency in construction material manufacturing enterprises. The economic efficiency of the construction materials industry is significantly influenced by global market conditions, investment activity, manufacturing dynamics, and changes in raw material prices. Therefore, assessing these factors is important for identifying the external conditions affecting the performance and competitiveness of construction material manufacturing enterprises. Table 1 presents the key global factors influencing the economic efficiency of the construction materials industry during 2021–2025.

**Table 2. Global Factors Affecting the Economic Efficiency of the Construction Materials Industry (2021–2025) [15]**

| Indicators                                                     | 2021   | 2022   | 2023   | 2024   | 2025   |
|----------------------------------------------------------------|--------|--------|--------|--------|--------|
| Global construction materials market (USD billion)             | 1245,6 | 1286,9 | 1331,5 | 1377,2 | 1422,3 |
| Global infrastructure investment (USD trillion)                | 2,60   | 2,74   | 2,89   | 3,05   | 3,22   |
| Global manufacturing output index (2021 = 100)                 | 100,0  | 103,4  | 106,2  | 109,7  | 113,1  |
| Industrial raw materials price index (2016 = 100)              | 179,2  | 172,8  | 163,7  | 162,4  | 164,6  |
| Global Manufacturing PMI (average)                             | 54,1   | 51,8   | 49,8   | 50,6   | 51,7   |
| Asia-Pacific share of global construction materials market (%) | 47,2   | 47,6   | 48,0   | 48,5   | 48,8   |

The data in Table 1 indicate that the global construction materials market increased from USD 1,245.6 billion in 2021 to USD 1,422.3 billion in 2025, while global infrastructure investment rose from USD 2.60 trillion to USD 3.22 trillion. The global manufacturing output index also increased from 100.0 to 113.1, reflecting an expansion in industrial activity. At the same time, the industrial raw materials price index remained relatively high despite declining from 179.2 to 164.6, indicating continued cost pressure on producers. The Asia-Pacific region strengthened its position, with its share of the global construction materials market increasing from 47.2% to 48.8%. Overall, these trends demonstrate that growing market demand and investment opportunities are accompanied by persistent resource-cost pressures, increasing the importance of cost optimization and efficient resource utilization in construction material manufacturing enterprises.

The construction materials industry in Uzbekistan has demonstrated steady growth in recent years, driven by increasing production capacity, investment activity, and export expansion. Table 2 presents the key development indicators of the industry for 2021–2025, reflecting changes in production, investment, employment, and major construction material outputs.

**Table 2. Key Development Indicators of the Construction Materials Industry in Uzbekistan (2021–2025)**

| Indicators                                              | 2021  | 2022  | 2023   | 2024   | 2025   |
|---------------------------------------------------------|-------|-------|--------|--------|--------|
| Indicators                                              |       |       |        |        |        |
| Production volume (UZS trillion)                        | 22,8  | 28,6  | 35.9   | 47.1   | 52.6   |
| Growth rate (%)                                         | 111.4 | 112.7 | 114.2  | 113.8  | 111.7  |
| Export volume (USD million)                             | 551   | 662   | 748    | 831    | 1 200  |
| Investments (USD billion)                               | 1.1   | 1.5   | 1.8    | 2.2    | 2.4    |
| Number of implemented investment projects               | 186   | 228   | 267    | 315    | 353    |
| Number of new jobs created                              | 8 450 | 9 860 | 11 940 | 13 800 | 15 200 |
| Cement production (million tons)                        | 15.7  | 17.1  | 18.6   | 20.2   | 21.5   |
| Construction glass production (million m <sup>2</sup> ) | 25.6  | 29.4  | 33.8   | 36.5   | 40.0   |
| Ceramic tile production (million m <sup>2</sup> )       | 28.3  | 33.7  | 39.4   | 43.2   | 47.0   |
| Gypsum board production (million m <sup>2</sup> )       | 72.5  | 82.1  | 93.6   | 101.4  | 110.0  |

As shown in Table 2, the production volume of construction materials increased from UZS 22.8 trillion in 2021 to UZS 52.6 trillion in 2025, while exports rose from USD 551 million to USD 1.2 billion. Investment increased from USD 1.1 billion to USD 2.4 billion, accompanied by an expansion in implemented investment projects from 186 to 353 and the creation of 15,200 new jobs in 2025. Production of cement, construction glass, ceramic tiles, and gypsum board also demonstrated sustained growth. Overall, these trends indicate a significant expansion of Uzbekistan's construction materials industry and highlight the increasing importance of improving production and resource efficiency at the enterprise level.

Although macroeconomic indicators characterize the overall development trends of the construction materials industry, an in-depth assessment of economic efficiency should be conducted at the enterprise level. This is because positive industry-wide growth may be reflected differently across individual enterprises in terms of resource utilization, production costs, profitability, and financial performance. Therefore, this study provides a comprehensive analysis of the economic performance of “Qarshi Benefit” and “Inter Mega Biznes” private enterprises during 2021–2025.

The assessment of enterprise performance was based on key economic indicators, including revenue, net profit, return on assets (ROA), return on sales, labor productivity, production costs, and resource utilization efficiency. The results of this analysis serve as the empirical basis for the multi-factor integrated assessment model developed in the subsequent stage of the study.

Table 3 presents the key financial performance indicators of “Qarshi Benefit” and “Inter Mega Biznes” for 2021–2025, providing a basis for comparing their economic performance.

**Table 3. Comparative Analysis of Revenue and Cost Indicators of the Studied Enterprises (2021–2025)**

| Indicator                        | Enterprise        | 2021  | 2022  | 2023  | 2024  | 2025  |
|----------------------------------|-------------------|-------|-------|-------|-------|-------|
| Net Revenue (UZS billion)        | Qarshi Benefit    | 120.5 | 135.7 | 142.4 | 150.2 | 158.0 |
|                                  | Inter Mega Biznes | 85.4  | 92.6  | 98.3  | 104.7 | 111.5 |
| Cost of Sales (UZS billion)      | Qarshi Benefit    | 95.3  | 108.9 | 113.5 | 118.7 | 124.0 |
|                                  | Inter Mega Biznes | 67.2  | 72.8  | 77.5  | 81.9  | 86.3  |
| Gross Profit (UZS billion)       | Qarshi Benefit    | 25.2  | 26.8  | 28.9  | 31.5  | 34.0  |
|                                  | Inter Mega Biznes | 18.2  | 19.8  | 20.8  | 22.8  | 25.2  |
| Operating Expenses (UZS billion) | Qarshi Benefit    | 8.4   | 9.1   | 9.8   | 10.2  | 10.8  |
|                                  | Inter Mega Biznes | 6.5   | 7.0   | 7.4   | 7.9   | 8.3   |
| Operating Profit (UZS billion)   | Qarshi Benefit    | 16.8  | 17.7  | 19.1  | 21.3  | 23.2  |
|                                  | Inter Mega Biznes | 11.7  | 12.8  | 13.4  | 14.9  | 16.9  |

The results indicate positive financial dynamics in both enterprises. During 2021–2025, Qarshi Benefit's net revenue increased from UZS 120.5 billion to UZS 158.0 billion, while Inter Mega Biznes increased its revenue from UZS 85.4 billion to UZS 111.5 billion. Operating profit also increased steadily in both enterprises, indicating an overall improvement in their financial performance.

In practice, enterprise economic performance is primarily assessed using individual financial indicators. However, such an approach does not fully reflect the actual economic condition of an enterprise, since production efficiency is determined not only by financial results but also by the level of resource utilization, labor productivity, and production costs. Therefore, this study develops a multi-factor integrated economic efficiency model for construction material manufacturing enterprises that combines financial, production, and resource-related factors within a unified assessment framework.

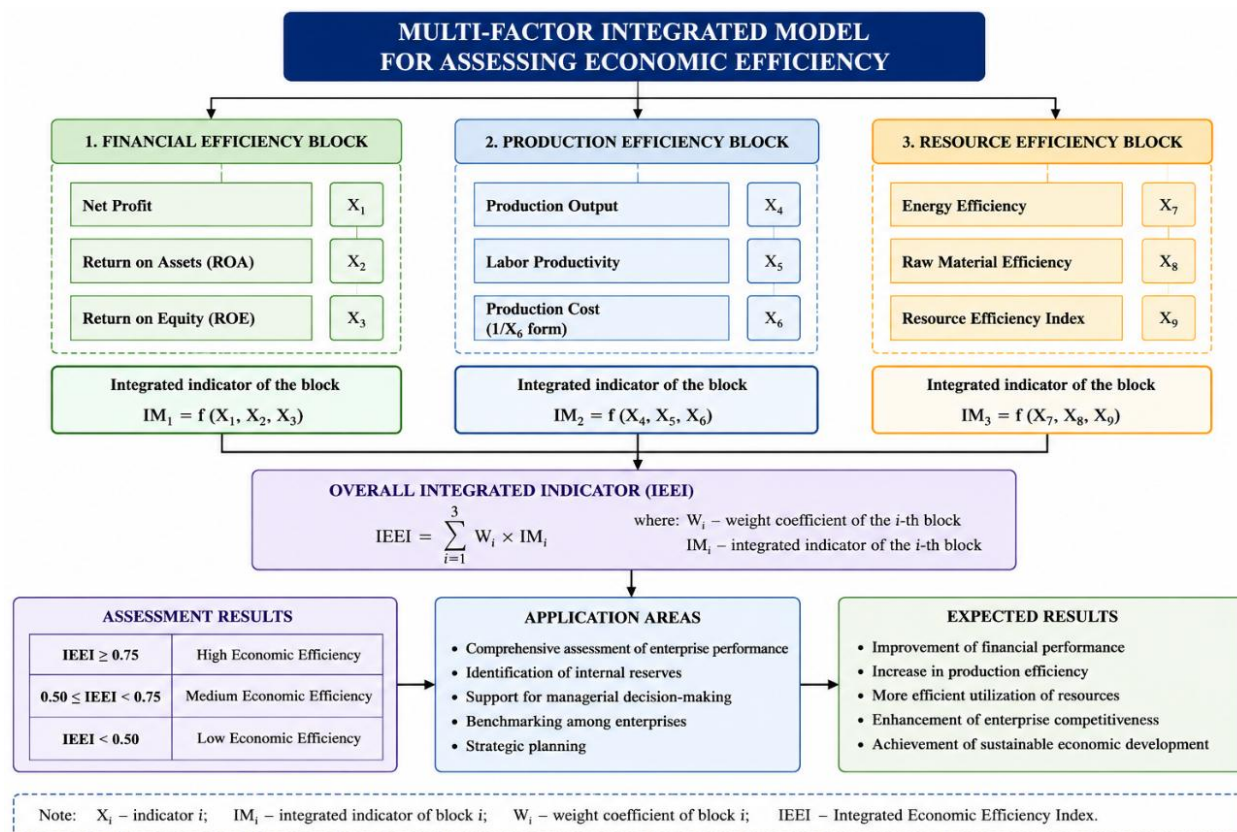


**Figure 1. Multi-Factor Integrated Model for Assessing Economic Efficiency in Construction Material Manufacturing Enterprises**

THE PROPOSED MODEL ASSESSES ECONOMIC EFFICIENCY BASED ON THREE KEY COMPONENTS: FINANCIAL EFFICIENCY, PRODUCTION EFFICIENCY, AND RESOURCE EFFICIENCY. THESE INTERCONNECTED COMPONENTS JOINTLY FORM THE ENTERPRISE'S OVERALL INTEGRATED EFFICIENCY ASSESSMENT. THE MAIN ADVANTAGE OF THE MODEL IS ITS ABILITY TO PROVIDE A COMPREHENSIVE EVALUATION BY CONSIDERING NOT ONLY INDIVIDUAL INDICATORS BUT ALSO THEIR INTERRELATIONSHIPS AND COMBINED EFFECTS.

**Table 4. Indicator System of the Multi-Factor Integrated Economic Efficiency Model**

| Assessment Block      | Indicator                 | Symbol | Weight |
|-----------------------|---------------------------|--------|--------|
| Financial Efficiency  | Net profit                | $X_1$  | 0.15   |
|                       | Return on assets (ROA)    | $X_2$  | 0.10   |
|                       | Return on equity (ROE)    | $X_3$  | 0.10   |
| Production Efficiency | Production output         | $X_4$  | 0.15   |
|                       | Labor productivity        | $X_5$  | 0.15   |
|                       | Production cost           | $X_6$  | 0.10   |
| Resource Efficiency   | Energy efficiency         | $X_7$  | 0.10   |
|                       | Raw material efficiency   | $X_8$  | 0.10   |
|                       | Resource efficiency index | $X_9$  | 0.05   |
| Total                 |                           |        | 1.00   |

Table 4 systematizes the key indicators characterizing economic efficiency. The model integrates financial, production, and resource-related factors into a unified framework, with weight coefficients assigned according to the relative contribution of each indicator to overall

economic efficiency. This approach enables a comprehensive assessment of enterprise performance and provides a scientific basis for managerial decision-making.

The Integrated Economic Efficiency Index (IEEI) was calculated using the following formula:

$$IESI = \sum_{i=1}^9 w_i Z_i$$

where:

IESI – Integrated Economic Efficiency Index;

$w_i$  – weight coefficient of the  $i$ -th indicator;

$Z_i$  – normalized value of the  $i$ -th indicator.

**Table 5. Integrated Economic Efficiency Indices of Construction Material Manufacturing Enterprises**

| Years | Qarshi Benefit | Inter Mega Biznes | Difference |
|-------|----------------|-------------------|------------|
| 2021  | 0,684          | 0,651             | 0,033      |
| 2022  | 0,712          | 0,677             | 0,035      |
| 2023  | 0,739          | 0,703             | 0,036      |
| 2024  | 0,781          | 0,742             | 0,039      |
| 2025  | 0,816          | 0,779             | 0,037      |

According to the results presented in Table 5, the Integrated Economic Efficiency Index (IEEI) demonstrated a consistent upward trend in both enterprises during 2021–2025. At “Qarshi Benefit,” the index increased from 0.684 to 0.816, while at “Inter Mega Biznes,” it rose from 0.651 to 0.779. These results indicate a gradual improvement in financial performance, production indicators, and resource utilization efficiency at both enterprises. The analysis also shows that “Qarshi Benefit” achieved relatively higher integrated efficiency scores. This advantage can primarily be attributed to higher levels of labor productivity, profitability, and resource utilization efficiency. At the same time, the steady increase in the index of “Inter Mega Biznes” confirms the positive effects of managerial measures implemented to improve the enterprise’s economic efficiency.

The proposed integrated model makes it possible to assess economic efficiency not merely through individual financial indicators but by incorporating the key factors affecting enterprise performance into a unified assessment framework. This approach enables the identification of performance differences between enterprises, the assessment of internal efficiency reserves, and the formation of a reliable analytical basis for subsequent benchmarking analysis. The findings are consistent with M. Porter’s Value Chain theory, R. Kaplan and D. Norton’s Balanced Scorecard approach, and J. P. Womack’s Lean Manufacturing concept. However, the distinctive feature of the present study is that economic efficiency is assessed by integrating financial, production, and resource-related factors into a single integrated index and combining this assessment with a benchmarking mechanism.

### Conclusions

The analyses conducted on the example of “Qarshi Benefit” XK and “Inter Mega Biznes” private enterprises made it possible to draw the following important conclusions regarding the improvement of economic efficiency in construction material manufacturing enterprises.

The findings demonstrate that assessing enterprise performance solely on the basis of individual financial indicators does not provide a comprehensive picture of economic efficiency. The integration of financial, production and resource efficiency indicators into a unified assessment framework enables a more objective and reliable evaluation of enterprise performance and supports scientifically grounded managerial decision-making.

The proposed multi-factor integrated assessment model proved effective in evaluating the economic efficiency of construction material manufacturing enterprises. By combining financial performance, production efficiency and resource utilization indicators into a single

integrated index, the model provides a comprehensive analytical tool for identifying strengths, weaknesses and hidden efficiency reserves.

The calculated integral economic efficiency indices indicate that both enterprises achieved positive development dynamics during 2021–2025. Nevertheless, differences in labor productivity, production costs and resource utilization efficiency reveal considerable opportunities for further improving enterprise competitiveness and operational performance.

The benchmarking analysis confirmed that comparing enterprise performance with industry best practices facilitates the identification of operational shortcomings, encourages the adoption of effective management practices and contributes to the continuous improvement of economic efficiency. The proposed benchmarking mechanism also serves as an effective instrument for supporting strategic planning and performance management.

Based on the obtained results, the following practical recommendations are proposed for improving economic efficiency in construction material manufacturing enterprises:

- implement the proposed integrated economic efficiency assessment model as a permanent management tool for monitoring enterprise performance;
- apply benchmarking methods to identify internal reserves and disseminate best management practices among enterprises;
- improve production efficiency by optimizing production costs, increasing labor productivity and ensuring the rational use of raw materials and energy resources;
- accelerate the implementation of digital management systems capable of monitoring production processes and resource consumption in real time;
- strengthen enterprise competitiveness through continuous technological modernization, efficient resource management and the introduction of innovative production practices.

**The scientific contribution of this study** lies in the development of a **multi-factor integrated assessment model** that combines financial, production and resource efficiency indicators with a **benchmarking-based management mechanism** for evaluating and improving enterprise performance. Unlike existing approaches, the proposed methodology provides an integrated framework for identifying efficiency reserves, supporting managerial decision-making and enhancing the sustainable competitiveness of construction material manufacturing enterprises.

The proposed methodological framework has broad practical applicability and may be employed not only in construction material manufacturing enterprises but also in other industrial sectors seeking to improve economic efficiency through integrated assessment and benchmarking. Future research may focus on expanding the empirical sample, incorporating additional sustainability indicators and developing econometric forecasting models to assess the long-term impact of managerial decisions on enterprise performance.

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