ALTERNATIVE SCENARIOS FOR INCREASING THE COMPETITIVENESS OF CONSTRUCTION INDUSTRY ENTERPRISES

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https://doi.org/10.5281/zenodo.15102663

Abstract
The article develops alternative scenarios (inertial, pessimistic, and optimistic) for increasing the competitiveness of construction industry enterprises. Furthermore, in the medium-term perspective, improving the efficiency of using the potential of the construction industry in Andijan region requires not only the region's resource potential, but also prioritizing the development of innovative product production along with the production of high-tech products. This can be achieved by enhancing the technical and technological aspects of the production chain and increasing the competitiveness of local construction enterprises.

Keywords: construction industry, inertial, pessimistic and optimistic scenarios, resource potential, pure construction materials, high-tech product manufacturing, production chain, competitiveness of construction enterprises

INTRODUCTION. In the context of New Uzbekistan, it is important to focus on enhancing the efficiency of utilizing the potential of the construction industry, among other sectors of the national economy, in order to achieve sustainable development. This is aimed at increasing the competitiveness of domestic manufacturing enterprises at both national and global levels. Additionally, development strategies have been developed for each sector, and their implementation is being carried out in phases based on roadmaps formed from relevant measures.

Currently, under the implementation of the New Uzbekistan Development Strategy, which is planned for the medium-term future, the volume of construction works in the country has sharply increased within the framework of the "Obod qishloq" ("Prosperous village") and "Obod makhalla" ("Prosperous neighborhood") programs [1]. This has made it possible to support the production of construction industry products through a demand-stimulating mechanism. In particular, the goal of the "Uzbekistan – 2030" strategy to "develop the 'driver' sectors of the industry and fully activate the industrial potential of regions" [2], which includes increasing the production of construction materials by two times and expanding the production of new types of energy-efficient materials, has been set. This requires developing scientifically grounded alternative development scenarios for increasing the efficiency of using the potential of construction enterprises in each region of the republic and ensuring the competitiveness of these enterprises.

LITERATURE REVIEW. In recent years, the practice of evaluating the competitiveness of construction industry enterprises through the volume of added value created in the sector has been adopted in the development of alternative scenarios for the future prospects of the construction industry. Specifically, the scientific research conducted by A. Gosh [5], A. Lecan [7], S. Mihai [8], F. Simoni [9], J.G. Bekes [3], V. De-Araujo [4], and T. Omotayo [6] is based on methodologies in this area.

Table 1

TOP 10 companies producing high value-added products in the global construction industry market, 2023 [10, pp. 49]

TOP	Company name	Country	Market turnover (million USD)
1	CHINA STATE CONSTRUCTION ENGINEERING CORP. LTD. (CSCEC)	China	319,949
2	CHINA RAILWAY GROUP LTD. (CREC)	China	178,434
3	CHINA RAILWAY CONSTRUCTION CORP. LTD. (CRCC)	China	160,713
4	CHINA COMMUNICATIONS CONSTRUCTION GROUP LTD. (CCCC)	China	107,144
5	METALLURGICAL CORPORATION OF CHINA LTD (MCC)	China	89,518
6	POWER CONSTRUCTION CORP OF CHINA	China	86,063
7	VINCI	China	74,459
8	BOUYGUES	China	60,591
9	CHINA ENERGY ENGINEERING CORP	China	57,342
10	SHANGHAI CONSTRUCTION GROUP (SCG)	China	43,021

According to the report prepared by the international organization "Deloitte Organization" on the development forces of the global construction industry, in 2023, eight construction industry enterprises from China, producing construction products with high added value, were included in the global TOP-10 list in terms of the volume of construction goods and services in the international market (see Table 1).

RESEARCH METHODOLOGY. The general strategy for economic development outlined in the works of the President of the Republic of Uzbekistan Sh.M. Mirziyoyev, The laws of the Republic of Uzbekistan, Government decisions, as well as foreign experiences dedicated to increasing the competitiveness of construction industry enterprises in the national economy, and used of logical, monographic, scientific abstraction, and comparative analysis methods have been employed.

ANALYSIS AND RESULTS. At the same time, China accounted for 53.5% of the global construction goods and services market turnover and the capitalization of enterprises, which demonstrates that it has a national construction industry with a high level of competitiveness. In terms of innovative activity, the USA (9.0%) and Japan (8.8%) contributed a combined 17.8% of the global construction goods and services market turnover (see Figure 1). These global trends in the construction goods and services market show that the global competitiveness of Chinese construction companies has been achieved due to the production of high-added-value products.

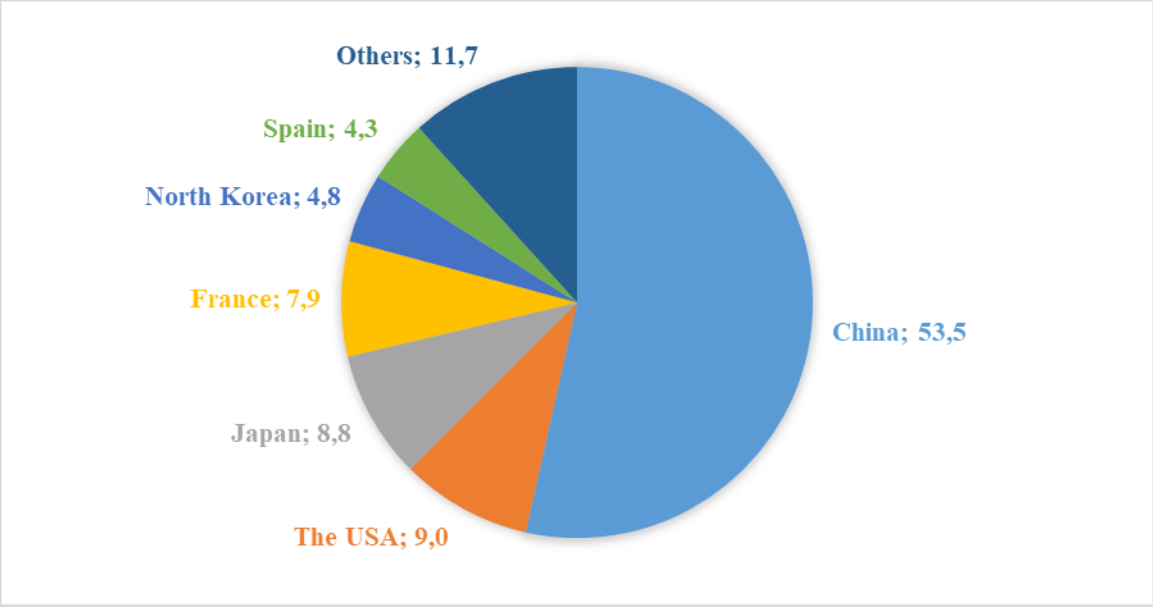

Figure 1. Share of National Construction Industry Sectors in the Global Construction Market by Product and Service Turnover and Capitalization Volume, as a Percentage of Total, 2023 [10, pp. 49]

Based on the analysis provided above, the next step is to develop alternative scenarios for increasing the competitiveness of local construction enterprises in the Andijan region in the coming years using a multiple regression-correlation model. In this case, the value of the added value created in the regional construction industry will be conditionally defined as an indicator that describes the competitiveness level of local construction enterprises, which will serve as the dependent variable in the model. The independent variables affecting the dependent variable are the number of local construction enterprises (x1), which participate in the competition, and the volume of construction works completed in the region (x2), which serves to stimulate demand for construction products. The data necessary to conduct the multiple regression-correlation analysis are presented in Table 2.

Table2:

Necessary Data for Multiple Regression-Correlation Analysis to Enhance the Competitiveness of Construction Industry Enterprises in Andijan Region [11]

Years	The volume of added value created in the construction industry, in billion soums. (*y*)	The number of active enterprises and organizations in the construction industry, in units. (x_1)	Volume of construction work performed, in billion soums. (x_2)
2010 y	146,8	1955	345,3
2011 y	244,5	1978	534,4
2012 y	297,4	2086	672,9
2013 y	417,6	2100	862,7
2014 y	510,8	2237	1131,8
2015 y	600,8	2339	1341,9
2016 y	705,4	2265	1578,0
2017 y	1348,9	2119	1782,9
2018 y	2043,4	2418	2819,5
2019 y	2539,7	2747	3539,1
2020 y	3044,6	3071	4673,0
2021 y	3571,2	3132	5657,8
2022 y	4099,8	3378	6864,1
2023 y	4428,6	2111	7384,3

In order to develop alternative scenarios for improving the competitiveness of local construction enterprises, a multiple regression model should be developed based on the multiple regression-correlation analysis hypothesis outlined as follows (1) function:

$$y = b_0 + b_1 x_1 + b_2 x_2 \qquad (1)$$

"The values of "$b_0; b_1; b_2$" in the given multiple regression model function are determined using the least squares method. These values serve as the vector coefficients for the independent variables (x_i) in the multiple regression model. Based on the least squares method, the vector coefficients of the independent variables in the model are determined using the following formula (2):"

$$s = (X^T X)^{-1} X^T Y \qquad (2)$$

"Using the least squares method mentioned above, the vector coefficients of the independent variables (x_i) are determined based on the data provided in table 2. The formula (3.2) should be used to calculate the resulting factor (y), the independent variables "(x_i) " and the vector coefficient values given above by forming the matrices for the "X^T" values (see Appendices 7-9). In the next step, based on the formed matrices, the values for "$X^T X$" and "$X^T Y$" in the least squares function (3.2) are calculated (see Appendices 10-11), and the value of "$(X^T X)^{-1}$" is determined as follows based on Appendix 10:"

$$(X^T X)^{-1} = \begin{array}{|c|c|c|}\hline 3,1014 & -0,00143 & 0,000157 \\ \hline -0,00143 & 1,0E\text{-}6 & 0 \\ \hline 0,000157 & 0 & 0 \\ \hline \end{array}$$

In order to develop alternative scenarios for improving the competitiveness of local construction enterprises, a multiple regression model should be developed based on the multiple regression-correlation analysis hypothesis outlined as follows (1) function:

$$Y(X) = \begin{array}{|c|c|c|}\hline 3,1014 & -0,00143 & 0,000157 \\ \hline -0,00143 & 1,0E\text{-}6 & 0 \\ \hline 0,000157 & 0 & 0 \\ \hline \end{array} * \begin{array}{|c|}\hline 23999,5 \\ \hline 64922293,4 \\ \hline 115669864,68 \\ \hline \end{array} = \begin{array}{|c|}\hline -326,6881 \\ \hline 0,1318 \\ \hline 0,615 \\ \hline \end{array}$$

Based on the calculations performed, we obtained a multiple regression model with the following form:

$$y = -326,6881 + 0,1318x_1 + 0,615x_2$$

Based on the developed multiple regression model, the following conclusions can be made:

The volume of added value created in the construction industry of Andijan region is interrelated with the activities of local production enterprises and the volume of construction work carried out in the region. That is, based on the consumption of construction products produced by local enterprises in the internal construction market of the region, the execution of construction works in the region has served to stimulate market demand for local enterprise products. The reason for this is that if the development trends of construction work carried out in the region and the activities of local construction enterprises and organizations

are not taken into account, the volume of added value created in the construction industry of the region is explained by the presence of a negative development vector.

The increase in the number of enterprises and organizations engaged in economic activities in the construction industry of Andijan region has led to a positive development vector, although the volume of added value created in the construction industry of the region is small. This situation indicates that the volume of added value of goods and services produced by local construction industry enterprises is low or the degree of assimilation of the product production chain by them is insufficient. It is important to note that the volume of added value created in the construction sector of the region is lower than that of other regional industrial sectors. This situation suggests the need to prioritize programs aimed at increasing the efficiency of utilizing the potential of the region's construction industry in the coming years. Through this, the creation of high added-value products by local construction enterprises, including increasing the level of assimilation of the product production chain in the specialization of the region's districts and cities in the construction industry, will lead to achieving higher competitiveness.

The increase in the volume of construction works in Andijan region has also resulted in a positive development vector for the volume of added value created in the construction industry of the region. According to the calculations, the increase in the volume of construction works has resulted in the added value created in the region's construction industry being 4.7 times higher than the development vector achieved due to the increase in the number of enterprises and organizations engaged in economic activities in the sector. This indicates that the level of development and competitiveness of construction services provision is higher in the region compared to product manufacturing in the construction industry.

In the next stage, based on the results of the developed multi-factor regression model, the conclusions should be reinforced through correlation analysis aimed at identifying the internal relationships between the result factor and the independent variables in the formed hypothesis. The correlation coefficient between the selected factors in the hypothesis will be determined using the following (3) function:

$$r_{xy} = \frac{\overline{x \cdot y} - \overline{x} \cdot \overline{y}}{s(x) \cdot s(y)} \quad (3)$$

Using the correlation coefficient determination function (3) mentioned above, we will evaluate the degree of internal correlation between the result factor and each independent variable:

The degree of internal correlation between the volume of added value created in the construction industry of the region and the number of active enterprises and organizations engaged in economic activities in the sector:

$$r_{yx_1} = \frac{4637306.671 - 2424 \cdot 1714.25}{449.676 \cdot 1493.115} = 0.718$$

According to calculations, the development trend of the added value created in the construction industry of the region has a strong internal correlation with the number of active enterprises and organizations engaged in economic activities in the sector, according to the Chedevk scale, with the correlation coefficient being 0.718. This indicates that the added value created in the construction industry of the region, in 28.2% of cases, is mainly generated by active construction enterprises and organizations. In this context, it is worth noting that according to the multiple regression model, the added value has a low additional growth vector due to this factor, which suggests the need to prioritize the development of high-tech product manufacturing in the sector.

The degree of internal correlation between the added value created in the construction industry of the region and the volume of construction works being carried out in the region:

$$r_{yx_2} = \frac{8262133.191 - 2799.121 \cdot 1714.25}{2339.527 \cdot 1493.115} = 0.992$$

Thus, the degree of internal correlation between the added value created in the construction industry of the region and the volume of construction works being carried out in the region is 27.6% higher than the correlation with the number of enterprises and organizations engaged in economic activities in the sector. According to the Chedok scale**,** there is a significantly strong internal correlation between them, with the correlation coefficient being 0.992. Based on this result, it can be concluded that the hypothesis of the formulated multiple regression model is correctly structured.

In the formulated multiple regression-correlation model, the internal correlation between the number of active enterprises and organizations operating in the region's construction industry and the volume of construction works carried out in the region:

$$r_{x_1x_2} = \frac{7525412.736 - 2799.121 \cdot 2424}{2339.527 \cdot 449.676} = 0.704$$

According to the results of determining the internal correlation between independent variables in the multiple regression-correlation model, it was found that there is a strong correlation between the number of active enterprises and organizations operating in the construction industry of the region and the volume of construction works performed in the region, according to the Chedok scale. The correlation coefficient expressing this was found to be 0.704. This situation indicates that the additional growth vector coefficient of the added value created in the local construction industry, achieved due to the volume of construction works performed in the region, is 29.6%, which corresponds to the region's non-residents.

Table 3

Correlation Analysis Matrix for Increasing the Competitiveness of the Construction Industry in Andijan Region

–	*y*	x_1	x_2
y	1	0,7178	0,9916
x_1	0,7178	1	0,7037
x_2	0,9916	0,7037	1

Based on the results of the conducted multiple correlation analysis, the correlation analysis matrix is presented in Table 3.6 in the following form, and the following conclusions have been reached:

The consistency and similarity of the results from the conducted multiple regression-correlation analysis indicate that the hypothesis formed regarding the improvement of the competitiveness of construction industry enterprises in the region is correct. This situation suggests that the conclusions obtained from the calculations, based on economic-mathematical methods, are scientifically proven.

In the construction industry of Andijan region, giving priority to increasing the level of integration in the production chain through the production of high-tech products by enterprises will enhance the competitiveness of local enterprises.

The development of the construction industry in the region, including the increase in the volume of construction work carried out in the region, has resulted in over two-thirds of the potential demand in the regional construction market being met by local enterprises. This situation indicates that there is an opportunity to expand the market coverage of enterprises by improving the efficiency of utilizing the development potential of the local construction industry;

The results of the conducted multiple regression-correlation analysis confirm that the increase in the added value created in the construction industry of the region serves as a basis for determining the alternative scenarios for improving the competitiveness of the region's construction enterprises, which can be used as a performance indicator in the development of alternative scenarios.

In the development of alternative scenarios to increase the competitiveness of construction enterprises in Andijan region, it is necessary to calculate the percentage change in the added value created in the construction industry based on the elasticity coefficient by considering the 1% change in the independent variables of the hypothesis formed in the multiple regression-correlation analysis. This will be done using the following function:

$$E_i = b_i \cdot \frac{\overline{x_i}}{\overline{y}} \quad (4)$$

To determine the change in the added value in the local construction industry as a result of a 1% change in the number of active enterprises and organizations in the construction industry, we apply the elasticity coefficient formula:

The degree of change in the added value of the local construction industry as a result of a 1.0% change in the number of operating enterprises and organizations in the construction industry of the region is calculated.

$$0.132 \cdot \frac{2424}{1714.25} = 0.186$$

According to the calculations, the degree of change in the added value of the local construction industry resulting from a 1.0% change in the number of operating enterprises and organizations in the construction industry of the region shows a positive trend, with the elasticity coefficient being 0.186. This situation further proves that the proportion of high-tech products in the product range produced by local construction industry enterprises is low, or the level of integration in the production chain is low.

Similarly, the degree of change in the added value of the local construction industry as a result of a 1.0% increase in the volume of construction works carried out in the region is:

$$0.615 \cdot \frac{2799.121}{1714.25} = 1.004$$

Thus, it was found that a 1% increase in the volume of construction works in the region leads to a positive trend in the change in the added value of the local construction industry, with the elasticity coefficient of 1.004. This further confirms the validity of the conclusions drawn from the multivariate regression-correlation analysis.

Based on the economic-mathematical methods used, it was concluded that, in the coming years, the added value created in the sector can be used as an indicator to describe the competitiveness of construction enterprises in Andijan region when developing forecast indicators for improving the competitiveness of local construction enterprises.

Based on this, medium-term forecasts were developed for the improvement of the competitiveness of construction enterprises in Andijan region, considering three different development scenarios: inertial, pessimistic, and optimistic.

The formulas used for the calculations of the forecast indicators for each scenario are presented in Table 4.

Scenario name	Forecast indicator calculation function
Inercion scenario	$y = 11{,}606x^2 + 161{,}86x - 362{,}1$
Pessimistic scenario	$y = -0{,}3376x^2 + 329{,}12x - 762{,}06$
Optimistic scenario	$y = 23{,}549x^2 - 5{,}4017x + 37{,}864$

The first forecast indicators are based on the inertial scenario, which assumes that the trends in the development of the construction industry enterprises and the level of competitiveness in Andijan region from 2010 to 2023 will continue unchanged. This scenario is based on the assumption of changes in time factors. According to the results of the forecast calculations for improving the competitiveness of construction enterprises in the region under the inertial scenario, it was determined that by 2028, the volume of added value created in the region's construction industry could increase by 48.1% compared to 2023 (see Figure 2).

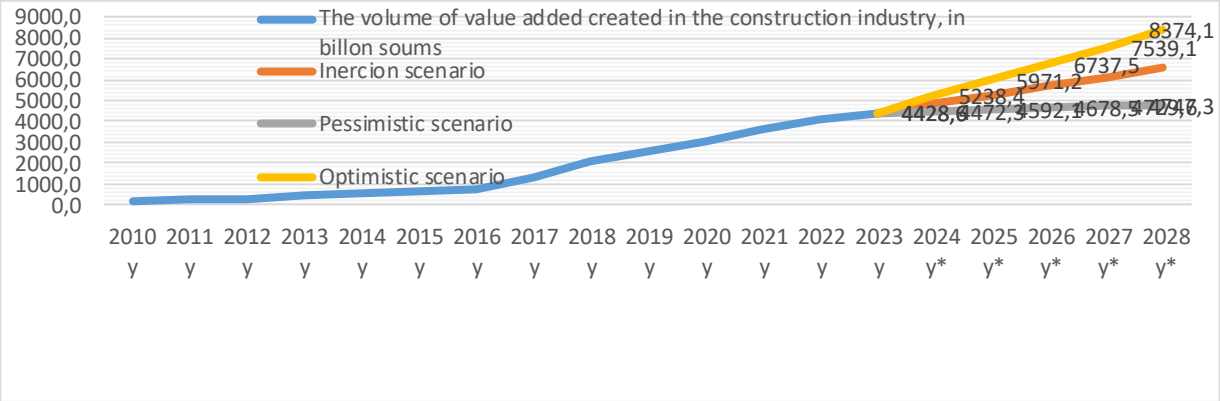

Figure 2. Prognostic indicators of alternative scenarios for improving the competitiveness of construction enterprises in Andijan region

In pessimistic scenarios, the level of integration in the product manufacturing chain of construction enterprises in Andijan region is expected to remain at its current state. Additionally, the share of high-tech products in the total construction product volume is not expected to change, with a focus on their moral obsolescence. The trends in the market turnover of goods and services produced by local enterprises will change primarily due to the increase in the volume of construction work. According to the forecast developed under this scenario, by 2028, the volume of added value created in the region's construction industry may increase by 7.2% compared to 2023. In the medium-term future, the growth rate of the added value created in the regional construction industry will be due to the increase in demand in the construction market, and the competitiveness of enterprises is not expected to increase. On the contrary, there is a high likelihood that the region will lag behind global development trends.

In the development of forecast indicators for improving the competitiveness of construction enterprises in Andijan region based on optimistic scenarios, priority is given to increasing the level of integration in the production of high-tech products, including the integration of the construction product manufacturing chain. This is achieved by raising the existing trends from 2010-2023 by an additional 5.0%, improving the technological shifts and innovation activity in the local construction industry. According to the optimistic scenario, it was determined that by 2028, the volume of added value created in the construction industry of Andijan region could increase by 89.1% compared to 2023.

In general, in the medium-term, in order to improve the effectiveness of using the potential of the Andijan region's construction industry, not only the region's resource potential, but also the integration of the production chain in technical and technological aspects, along with the production of high-tech products, should be prioritized. This will contribute to the improvement of the competitiveness of local construction enterprises by developing the production of innovative products.

CONCLUSIONS AND RECOMMENDATIONS: We believe that it is appropriate to focus attention on the expected outcomes in improving the effectiveness of the competitiveness of construction industry enterprises. Therefore, in the medium-term, based on the inertial, pessimistic, and optimistic scenarios for improving the competitiveness of construction enterprises in Andijan region, we came to the following conclusions:

In accordance with the inertial scenario, the activities and competitiveness of construction enterprises in Andijan region will change based on the time factor according to the existing trends of 2010-2023. Through

the inertial scenario, it is expected that the volume of added value created by the construction enterprises will increase by 48.1% by 2028 compared to 2023.

In the pessimistic scenario, the level of change in the production chain of construction enterprises in Andijan region will prioritize the moral obsolescence of the products, as the share of high-tech products in the total construction product volume remains unchanged. Only the increase in construction work volume will affect the market turnover of goods and services. According to this scenario, by 2028, the volume of added value created in the region's construction industry will increase by 7.2% compared to 2023. However, the competitiveness of the enterprises will not increase, and there is a high likelihood of falling behind global development trends.

In the optimistic scenario, priority will be given to improving the technological shifts and innovation activity in the local construction industry by increasing the integration of the high-tech product manufacturing chain by an additional 5.0% based on the trends from 2010-2023. As a result, it is expected that by 2028, the volume of added value created in the construction industry of Andijan region will increase by 89.1% compared to 2023.

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