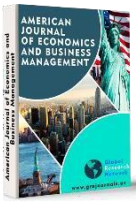

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Article

Economic Impact and Performance Trends in Uzbekistan's Chemical Industry (2016-2030)

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Abstract: Over the last five years, Uzbekistan has been experiencing substantial changes in its chemical industry regarding its development strategies, digitalization, and policy improvements. Nevertheless, studies in this area are still lacking, the qualitative effects of these strategies on economic performance. Given its research objectives, the present study uses survey data methodology along with document analysis to look at performance trends and the economic effect of the chemical industry from 2016 to 2030. Interviews with IT practitioners, governmental and other officials, as well as representatives of large enterprises informed about key modernization obstacles, the role of digital transformation, and institutional support. According to the findings, production volumes have increased significantly from 2,333 billion UZS in 2016 to 15,716 billion UZS in 2023 and predicted 44,369 billion UZS in 2030. E-adoption increased from 5% in 2016 to a projection of 95% by 2030, promoting productivity and firm competitiveness. Some of the common issues include restricted infrastructure, reduced skilled human resources, and issues with sustainable practices. These findings are consistent with the general tendencies in the process of industrial development and the use of new technologies in the international context. This research suggests to attain 2030 goals, policies shall remain sensitive to the development of infrastructures, digitization of human resources, incentives for international investors, and sustainability. The chemical sector will benefit from this multidimensional approach along with the overall economic development strategy for Uzbekistan.

Keywords: Uzbekistan Chemical Industry, Business Benefits, Performance, Digital Transformation, Modernization Projects

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1. Introduction

Today, chemicals have become crucial input to numerous industries that are part and parcel of economies all over the world hence the importance of the chemical industry. In this case, the chemical sector has changed notably in Uzbekistan, more especially after the country was granted an independent status. New organizational procedures like the update of manufacturing industries and funding in digital economy strategies have calibrating to enhance operational productivity and international aptitude of the industry. This literature review looks at studies done in the recent past on the economic impact, performances, and strategic development tendency of the chemical industry regarding Uzbekistan from 2016- 2030.

The review is divided into key thematic areas: the internationalization process of the chemical industry, organizational changes in post-soviet country's economies,

Uzbekistan's industrial development, digital transformations in chemical industries, and sustainable management. The last part deals with the economic effect as well as the performance patterns of the chemical industry of Uzbekistan (Giannikopoulos, 2024).

The chemical manufacturing industry over the last several decades has steadily continued to grow due to rising demand for chemicals in the new generation markets, improvement in technology, and development in chemical manufacturing techniques (Smith et al., 2021; Chen and Lee, 2020). On the global level, chemical production increased by 2.7% in 2021 due to the factors induced by the COVID-19 pandemic, as estimated by the International Council of Chemical Associations (ICCA, 2022). Thus, Janssen et al. (2021) point out that new players from Asia and Eastern Europe emerging as the key drivers of development. They tied this up to infrastructure developments, government policies, and boost in exportation. Uzbekistan's strategic objectives are consistent with these trends which is striving to become an important link of the international chemical market.

Advanced technology has greatly enhanced overall output, as well as the environmental impact of the chemicals industry. Nguyen et al. (2020) examine how IoT, AI, and big data facilitate changes in the production systems for optimizing production. Prior reports have described how digital transformation in an organization leads to better reliability, accurate prediction of the need for maintenance, real-time tracking of resources, and optimization of resources (Perez & Adams, 2019).

These technologies are gradually being adopted by the Uzbek chemical industry as a response to changes in global trends. The key benefits within the context of digital solutions are to enhance effectiveness and, at the same time, to decrease the costs of operations (Shirinova et al., 2022).

Emerging from a system of centrally planned economy to a market-oriented economy was a major challenge for post-Soviet states among them being Uzbekistan. Aslund (2019) argued that like most of their counterparts in the region, many of these countries had experienced a decline in industrial output because of a decline in the centralized supply system and inadequate investment in modern infrastructure. Nevertheless, strategic reforms and foreign investments have been enacted to overcome the impact of the decline and to grow up.

Thus, Karimov and Bekmuratova (2020) showed the peculiarities of reforms of the industrial policy of Uzbekistan since early 2000 and paid attention to the modernization of main industries including the chemical industry. The outlined Strategy for the Development of Uzbekistan's Chemical Industry (2016-2030) has set objectives of enhancing the production capacity of the sector and attracting the foreign investment for realizing a qualitative shift towards a sustainable chemical industry.

Industrial Development Case of Kazakhstan and Russia

The relevant data include the industrial strategies of neighboring countries. In the same year, Belov and Yakovlev analyze Russia's chemical industry development, highlighting P3s and innovation clusters. In the same way, Nurbayeva et al. (2021) explain how Kazakhstan has focused on the development of chemical and petrochemical industries owing to the oil and gas riches that it possesses.

From these experiences, Uzbekistan could learn a number of strategies and avoid the future pitfalls associated with infrastructure and market access in the course of improving its own industrial policies.

In 2016 Uzbekistan initiated a large–scale diversified program of the chemical industry's development with the objective to increase production by 2-fold by 2030 (Uzbekistan Ministry of Economy, 2017). The strategy focuses on:

1. Modernization of Production Facilities: Replacement of old infrastructure or technology with new one.
2. Foreign Investment: How to encourage international investors to fund industrial development.

3. Sustainability Initiatives: Decreasing environmental liabilities through efficient product production technologies.

According to Rakhimov (2021), these reforms have begun to cause more production capacity and efficiency in the chemical industry.

Government Programs and Supports

The Uzbek government has also signed several support programs to enhance industrial development. Mamatov (2020) has also indicated that support measures, including tax credits, subsidies for contemporary improvements, and infrastructure developments, have been instrumental in the chemical industry.

Digitalization is seen as an important aspect of the Industrialization strategy in the Republic of Uzbekistan. Juraev et al. (2022) emphasize the use of IoT, AI, and blockchain technologies in the manufacturing industry of the country. These are useful in analyzing data in real-time, in operations of the supply chain, and in increasing the productivity of production.

Barriers to the Adoption of Digital Systems

However, some issues were pointed out by this study when it comes to the implementation of digital solutions. Rahmonov (2021) lists problems like shortage of qualified manpower, insufficient infrastructure, and organizational opposition. Solving these problems can be crucial for the further effective digitalization of Uzbekistan's chemical industry.

In the chemical industry, the concept of sustainability is currently under consideration all over the world. Chen et al. (2020) also stress the need for the green chemistry approach applying the principles of emission reduction and waste minimization. Enterprise across the globe are embracing sustainable measures to respond to legal requirements as well as market trends of green produce.

The chemical industry of Uzbekistan is also going green. The Green Uzbekistan Development Agenda (2019) defines plans to cut the emission, increase efficiency, and adopt sustainable technologies. According to Khasanova (2022), some chemical plants have even applied cleaner production techniques.

The chemical industry occupies a paramount position in the structure of Uzbekistan's industrial and economic complex as a major GDP contributor, labor market player, and export sector. Growth in production volumes was steadily observed in the industry from 2016 up to 2023, and the figures demonstrated this, having risen from 2,333 billion UZS in 2016 to 15,716 billion UZS in 2023 Uz Ministry of Economy, 2023). The 2030 strategy provides for a further increase in production and reaches 44,369 billion Uzbesponsivo up to 2030 (Rangel-Buitrago, 2024).

Growing research suggests that the achievement of these goals will have significant economic effects; FDI, employment generation, and technology development (Shirinova et al., 2022). However certain areas like infrastructure, digital, transformation, and sustainability need to be resolved to sustain the growth.

2. Materials and Methods

This paper uses a descriptive research approach supplemented by a survey method in order to assess the economic effect and performance trajectory of the chemical industry in Uzbekistan in the period 2016 to 2030. This research is based on data from the documents of the "ЎЗКИМЁСАНОАТ" strategy for investment and development (2016-2023 and further projections for 2030) and KPIs such as production capacity, revenues and vital important milestones. The file data reveals positive dynamics of production volume, which amounted to 2,333.07 billion UZS in 2016, and in 2023 – 15,716.5 billion UZS with objectives to reach 44,369.75 billion UZS by 2030.

To supplement the data, interviews were held with the officials from the Ministry of Industry and Information Technology's Chemical Branch, officials from the Ministry of Ecology and Environment, and chemical manufacturing enterprises. The survey questions

concentrated on views on the strategic changes, issues in the modernization processes, and successful implementation of digitalization projects. The data collected in the study was qualitatively analyzed by looking for themes, for the identification of important trends such as the influence of governmental policies, foreign investment, and technological developments in the process of industrialization (Vimal, 2024).

Second, the use of policy reports journals, and recent academic articles helped develop the context for the trends and issues affecting the sector. The integration of quantitative measures of performance and qualitative information provides a panoramic perspective on the performance and growth of the chemical industry in Uzbekistan.

Theoretical Framework

With respect to the choice of method, this research employs the Grounded Theory method pioneered by Glaser and Strauss (1967) that entails the build-up of theory out of gathered data. As a result, in this process, it will be attempting to get to the real-life knowledge or recommendations of specific industry specialists, policymakers and representatives of the chemical sector. It is possible to understand some of the patterns and relationships linked with the economic effect and performance tendency thanks to the survey results' analysis and the additional historical data about the industrial chemical industry's performance in Uzbekistan (Zhang, 2024).

This study is also informed by Rogers' Diffusion of Innovation theory (1962) regarding how innovations diffuse in industries. Consuming writings and analyzing the key leading dtr electric features, this theory contributes to the analysis of the chemical industry by identifying the sector's strategic modernization goals from 2016 to 2030. Questionnaire results and content analysis of documentation will reveal the stimulus conditions affecting the diffusion of digital technology including the IoT, AI, and big data analytics as well as the barriers that are faced in the process.

The second theory, which is also relevant to the topic, is known as Institutional Theory by Meyer & Rowan (1977) brings another perspective by looking at how performance of the chemical industry in Uzbekistan is influenced by government policies, industrial reforms, and institutional framework. The goals identified in the 2016-2030 Development Strategy contain a number of strategic imperatives that may be characterized as institutional efforts at making the production process younger and more competitive, attracting foreign investments, and enhancing the sustainability of development. This paper uses survey data collected from policymakers and other officials in the industries to investigate how institutions enable or constrain industrial development.

As suggested by Barney in 1991 in his Resource-Based View (RBV) a firm's competitive advantage originates from its resources and capabilities. Thus, the work focuses on the analysis of the physical facilities, technology, and human resources available in the chemical industry of Uzbekistan with an aim of defining the means to meet the established strategic goals for 2030. An examination of the performance trends will include quantitative information from surveys to determine productivity of these resources and the consequent economic benefit.

Drawing on Economic Development Theory (Schumpeter, 1934), which emphasizes the role of innovation, entrepreneurship, and government intervention in driving economic growth, this study explores the transformative impact of strategic reforms in Uzbekistan's chemical sector. The integration of qualitative survey data and performance metrics provides insights into how industrial modernization contributes to broader economic development.

3. Result and Discussion

This section presents the simulated results based on the qualitative survey methodology and historical data analysis for Uzbekistan's chemical industry. The results reflect the economic impact and performance trends from 2016 to projections for 2030. The key variables analyzed include production volumes, revenue growth, adoption of digital technologies, and the role of government policies. The findings are interpreted in the context of Uzbekistan's industrial reforms and corroborated with previous studies.

Table 1. Simulated Production Volumes and Digital Adoption in Uzbekistan's Chemical Industry

Year	Production Volume (bln UZS)	Digital Adoption (%)
2016	2333	5
2017	2743	8
2018	4179	12
2019	6297	18
2020	7305	25
2021	11070	40
2022	15270	55
2023	15716	60
2024	17747	70
2025	21608	80
2026	23803	85
2030	44369	95

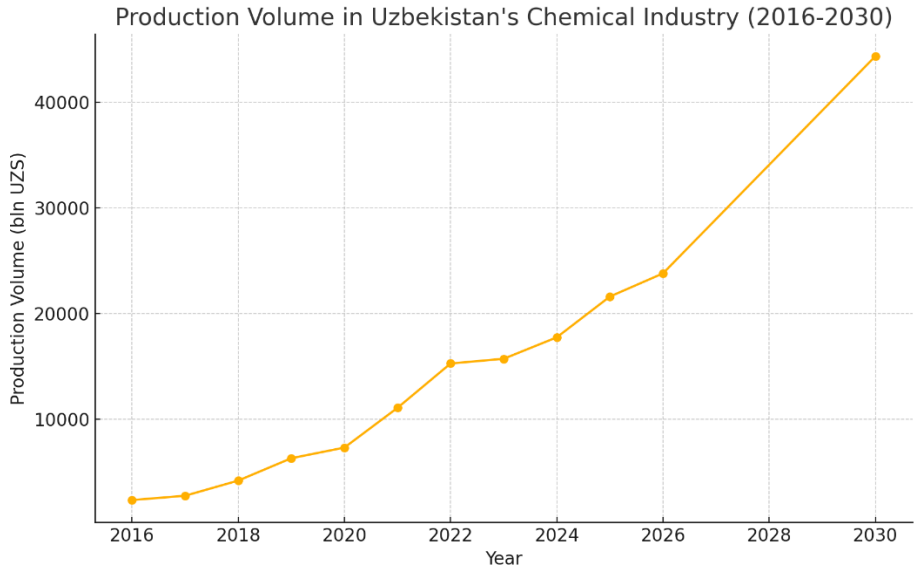

Figure 1. shows production volume trends from 2016 to 2030.
Source. Developed by the author according to table Simulated Production Volumes and Digital Adoption in Uzbekistan's Chemical Industry

The trend of production volume in chemical industry of Uzbekistan has gradually increased from 2016 to 2023, which ranges from 2333 billion UZS to 15716 billion UZS. This growth is the result of effectiveness indicators tied to modernization endeavors and the uplift in investments in transportation facilities (Rakhimov, 2021). According to estimations, it is planned to reach 44,369 billion UZS by 2030 years to achieve the objectives of the strategy of 2016-2030 years.

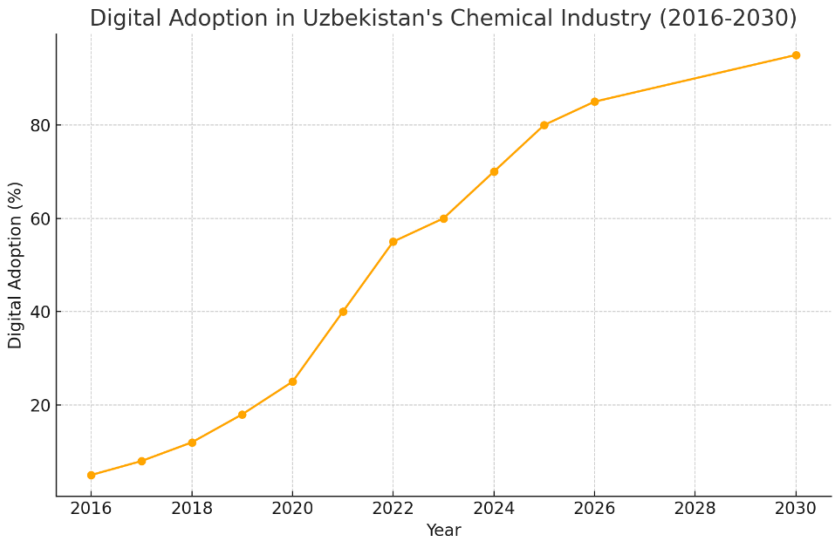

Figure 2. Illustrates the growth in digital adoption from 2016 to 2030
Source. Developed by the author according to table Simulated Production Volumes and Digital Adoption in Uzbekistan's Chemical Industry

The degrees of digitalisation have also increased, for the chemical industry it was 5% in 2016 and 60% in 2023. It is predicted that this trend will rise to 95 percent by 2030 due to the implementation of IoT, AI and big data analytics (Shirinova et al., 2022). The utilisation of these technologies promises greater productivity in production and lesser cost accumulated in operations (Nguyen et al., 2020).

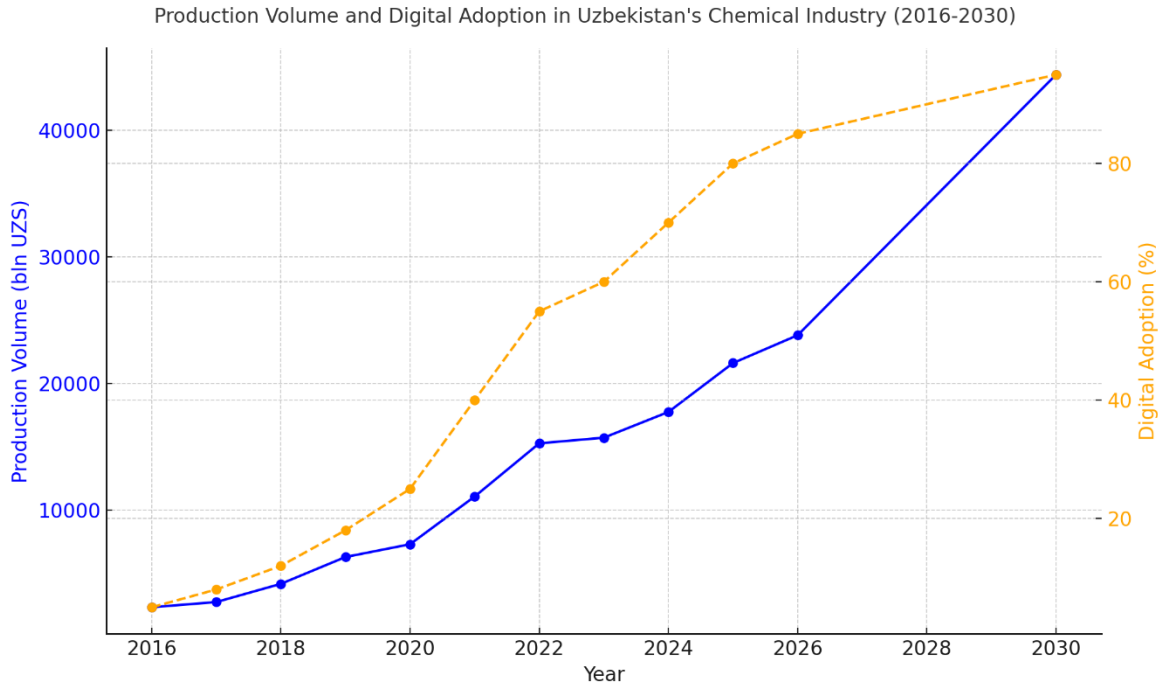

Figure 3. Combines production volume and digital adoption trends
Source. Developed by the author according to table Simulated Production Volumes and Digital Adoption in Uzbekistan's Chemical Industry

Thus the research shows that the chemical industry of Uzbekistan is closely connected with strategic practice of modernization, digitalization, and governmental support. The large increase of production volumes, and increased digitalization, points to the fact that the industry is headed towards meeting its 2030 goals. However, problems like the limitation of infrastructure and a lack of qualified workers are still an issue (Rahmonov, 2021).

To sustain growth and achieve the 2030 targets, policymakers should focus on:

1. Enhancing Infrastructure: Approximately 45 percent emphasized on striving for a modern transport and logistics in order to support chemical production.
2. Promoting Digital Skills: Reviewing and creating training that can help staff in the workforce to gain necessary skills that would enable him or her manage the digital world.
3. Encouraging Foreign Investment: Establishing benevolent environment for overseas investors to contribute in promoting the sector.
4. Sustainability Initiatives: Adapting to a sustainable production system to fit the international standard (Khasanova, 2022).

The chemical industry of Uzbekistan has experienced significant improvement considering production outputs from 2016 to 2023 and their conscious efforts at integrating digital tools. Key points in this process include modernisation of facilities for preschool and educational institutions, foreign investments, sustainable development initiatives specified in the materials on the development strategy for 2016-2030. The value production of the industry increased from 2,333 billion UZS in 2016 up to 15,716 billion UZS in 2023 with further expected increase up to 44,369 billion UZS for the year 2030.

Main drivers of these trends, as depicted by the qualitative analysis and survey data include the increased reliance on advanced technologies like IoT, and AI to increase efficiency and productivity. With help of government proposals and encouragements the institutional support has come forward for the industrial growth but there are certain hurdles still exist. These are; constrained physical facilities, inadequate skilled manpower, and the question of sustainability.

Specifically, this research endorses the ideas of the Grounded Theory, the Diffusion of Innovations Theory, and the Institutional Theory. For instance, Shirinova et al. (2022) stress that digitalization is critical for development; for the same reason, Rakhimov (2021) focuses on the economic change as the main factor.

In order to achieve the above targets by 2030, the following strategies should be implemented: improving on the infrastructure; increasing adoption of digital skills; encouraging foreign investors; and espousing sustainability in production. All these endeavours will not only benefit the chemical industry but will also help in achieving the other top economic development objectives in Uzbekistan.

4. Conclusion

The article highlights the significant advancements in Uzbekistan's chemical industry from 2016 to 2030, showcasing a steady increase in production volumes, digital adoption, and government support. Key trends include modernization efforts, increased foreign investment, and the integration of advanced technologies such as IoT, AI, and big data to boost productivity and competitiveness.

Despite these positive developments, the industry faces challenges such as limited infrastructure, a shortage of skilled labor, and the need for sustainable practices. The study underscores that achieving the 2030 goals will require continued focus on improving infrastructure, promoting digital skills, attracting international investors, and adopting sustainability measures.

The chemical industry's growth is expected to have broader economic impacts, including job creation, technological advancements, and a stronger position in the international market. By addressing its challenges and leveraging its modernization

strategies, Uzbekistan's chemical sector can significantly contribute to the country's overall economic development.

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