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## Enhancing Innovation Activities in Industrial Enterprises for Competitive Advantage

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**Abstract:** This article explores the enhancement of innovation activities within industrial enterprises, addressing the critical need for competitive advantage in the evolving global economy. Despite significant progress, a gap persists in comprehensively understanding the effective integration of various innovation types and their impact on organizational goals. Using a mixed-methods approach, including qualitative case studies and quantitative surveys, the research identifies key factors that influence successful innovation implementation. Findings reveal that targeted innovations, when strategically aligned with enterprise objectives, significantly boost productivity and market positioning. The results underscore the importance of a robust innovation management framework, suggesting that enterprises adopting these strategies can achieve sustainable growth and competitive superiority in their respective industries. These insights have profound implications for policymakers and business leaders aiming to foster a dynamic innovation ecosystem.

**Keywords:** economics, innovations, digital economy, information technologies, information and communication technologies, innovation process, innovation activity, organization

### 1. Introduction

Significant changes have occurred over the last few decades, both in ordinary people's lives and in the field of special professional activities, as a result of scientific and technological progress and, on the other hand, of significantly increased competition. The industrial stage of economic development enabled firms to gain a competitive edge through capital concentration, the development of integration processes, and growing market domination through mergers and acquisitions. In the context of the knowledge economy, innovation economy, new technological opportunities, and non-standard forms of doing business, based on enterprise management's ability to foresee possible changes in technology and technology, as well as the ability to identify possible and effective areas of application of innovations, and to create new needs among potential consumers, become more significant.

States around the world compete for modern technology, advantages over other countries, and to stand out. Competition in any sector of activity has a good effect: it reduces the time required to generate ideas and drives us to pay closer attention to the quality of inventions and their dissemination. Innovative activity with analogues—competitors is more disciplined. Organisations must devote greater resources to analysing the consumer market. The analysis of competitive organisations' innovative activity becomes a fundamental aspect of enterprise strategy, significantly influencing new ideas. Every day, new technologies emerge in the world, displacing rapidly obsolete innovations that just a

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short time before ruled the world. Competition pushes inquisitive minds to further improve all spheres of life, search for optimal, modern processes.

Competition drives inquisitive brains to improve all aspects of life and seek for ideal, modern techniques.

The President of Uzbekistan emphasised the need of aggressively developing cooperative innovation programmes within the framework of the Commonwealth and supporting start-up ventures with the active participation of young entrepreneurs.

At the moment, this project is in high need, as the rapid development of high technologies necessitates increased innovative cooperation across countries.

It is worth noting that in recent years, Uzbekistan has made great progress in the field of innovation. Targeted actions were made to promote the innovative development of the republic's economic and social sectors, to provide comprehensive support and increase the effectiveness of research and scientific activities, and to provide new channels for financing scientific initiatives.

## 2. Materials and Methods

The methodology employed in this study on improving innovation activities of industrial enterprises encompasses a comprehensive mixed-methods approach designed to provide a holistic understanding of the factors influencing successful innovation implementation. Initially, an extensive literature review was conducted to identify existing theories and frameworks related to innovation in industrial enterprises. This was followed by qualitative data collection through semi-structured interviews with key stakeholders, including managers, engineers, and innovation officers from various industrial enterprises. These interviews aimed to gather in-depth insights into the practical challenges and strategies employed in fostering innovation. Concurrently, a quantitative survey was administered to a broader sample of industrial enterprises to capture data on innovation activities, including types of innovations adopted, resources allocated, and the perceived outcomes of these initiatives.

The survey included Likert scale questions and open-ended responses to ensure both quantifiable data and qualitative nuances were captured. Data from the surveys were statistically analyzed to identify patterns and correlations, while the interview transcripts were subjected to thematic analysis to extract key themes and insights. The integration of qualitative and quantitative data provided a robust framework for understanding the multifaceted nature of innovation in industrial enterprises. This mixed-methods approach not only allowed for a detailed examination of current practices and outcomes but also facilitated the identification of best practices and potential areas for improvement. The findings from both data sources were triangulated to enhance the validity and reliability of the results, ultimately providing a comprehensive view of how industrial enterprises can enhance their innovation activities to achieve competitive advantages in the global market.

## 3. Results and Discussion

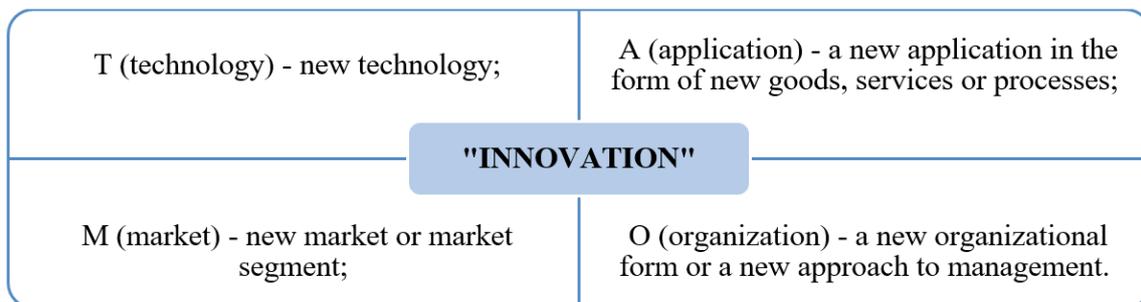
Invention is defined as an implemented invention that improves the efficiency of market-demanded processes or products. It is the culmination of human intellectual endeavour, including imagination, the creative process, discoveries, innovations, and rationalisation. Innovation can be defined as the introduction into the market of products (goods and services) with novel consumer attributes or a qualitative gain in production system efficiency [1].

The term "innovation" is derived from the Latin word "novation," which means "update" (or "change"), and the prefix "in," which is translated from Latin as "in the direction," if translated literally as "Innovation," or "in the direction of change." The concept of innovation initially originated in scientific research during the nineteenth century. The notion

of "innovation" was given fresh life at the beginning of the twentieth century by the Austrian economist J. Schumpeter's scholarly works as a result of the examination of "innovative combinations," changes in the evolution of economic systems [1].

Innovation is defined as one that significantly improves the efficiency of an existing system.

Consumer innovations are capable of meeting a wide range of personal demands. Consumers in this situation are typically people and families. Consumer innovation aims to improve the economic, social, and psychological effects of utilising a product. Another sort of innovation is known as investment innovation. Such innovation will be consumed by a manufacturing firm, a scientific organisation, or an individual entrepreneur. The goal of production innovation is to increase the economic impact in the output of the firm that purchased the innovation.



**Figure 1.** Main components of innovation [2]

Thus, innovation might arise from the introduction of a new technology, the usage of a new application, the creation of new markets, or the implementation of new organisational forms. In most cases, it is a combination of multiple elements introduced both concurrently and sequentially.

General informatization is being superseded by digitalization (digitalization), which will result in the establishment of a digital economy. Politicians and economists are paying close attention to the digital economy (DE), which is a relatively new phenomena. Many governments have already decided to pursue a digital development strategy. South Korea, the United States, the United Kingdom, Singapore, China, and other developed or rapidly expanding economies have launched national programmes to capitalise on digitalization potential and achieve new digital economic impacts.

The necessity for new sources of innovation to secure long-term economic growth is the driving force behind many countries' national ambitions to transition the economy to a digital route of development.

In conditions of high uncertainty and instability of the external environment, the progressive development of innovation-oriented enterprises can only be achieved through the development and implementation of qualitatively new ways of managing their innovative potential. At the same time, in the course of creating an effective mechanism for managing the innovative potential of a commercial structure, it is necessary to take into account not only the features of its formation, but also the innovative capabilities of the enterprise, so that the use of this mechanism will ensure the achievement of the planned indicators of the innovative activity of the economic agent on a systematic basis.

Since it is the level of innovative potential of an economic entity that determines the readiness of a commercial organization to produce innovations, a detailed study of the essence and specific tools for implementing the mechanism for managing the innovative potential of an economic agent is of particular relevance.

Revealing the functional-substantive approach to determining the mechanism for managing the innovative potential of an enterprise, we will consider the essence of the category “mechanism”.

In general, mechanism as a scientific term is most often used in technical, natural science and economic research. In general terms, it is a set of states or processes that determine a phenomenon.

The control mechanism is an important part of the management system. Performing organizing, informational, activating, coordinating, regulating, and infrastructural roles, he sets the necessary pace and direction for the development of an economic entity in accordance with the set goals and under the determining influence of environmental factors.

Innovations also concern water supply to ferrous metallurgy industries. To calculate salt concentrations in subsections and optimize the structure of water supply systems, a technological model with its mathematical description has been developed. The Elsit HDTV induction melting installation allows you to save energy. Thanks to its high power, the furnace heats up instantly and allows you to immediately melt the metal. Flat rolling equipment for cross-wedge rolling of workpieces is used in the manufacture of high-precision parts of complex configurations.

The automated complex allows you to increase productivity by 2 times, reduce rolled metal consumption by 30%, increase manufacturing accuracy and reduce the labor intensity of further operations.

The use of innovations in metallurgy, the introduction of modern technology, and the modernization of existing ones increase the renewal rate of fixed production assets to 5%. In the future, by 2022 the metallurgical industry will reach the world level in terms of the number of products produced.

In the modern mining and metallurgical complex, there is increasingly a need for the use of new technologies that make it possible to develop the extraction and processing of products taking into account the requirements of environmental friendliness and cost-effectiveness of production. Because there are fewer and fewer high-quality deposits that would allow subsoil users to easily and with high margins extract and process products.

Many innovations await metallurgy itself in the coming years - an industry that has existed for more than 2 thousand years, until recently developed by randomly selecting melting/forging parameters and combining different elements. Of course, over the past 350 years this knowledge has been consolidated and systematized, and yet, even at the end of the 20th century, the creation of complex alloy steels required high qualifications. Modern technologies open incredible prospects for metallurgists.

At mining enterprises, unqualified personnel pose a danger not only to themselves, but also to the entire enterprise. By allowing personnel who were not properly trained to work: when dump trucks did not comply with the speed limit and fell into the quarry, when an excavator collapsed part of the roof on itself, when a drilling machine, moving around the industrial site, did not turn the rod and touched an exposed wire. Often such mistakes end tragically; in addition, they lead to significant losses of expensive mining equipment. Today, many large companies, when hiring new employees, send them to virtual classes, where using simulators they can master in detail the control of complex equipment and work out possible emergency situations.

The advent of laser rangefinders has significantly improved the working conditions of surveyors. If previously measurements were carried out with a large number of simplifications and approximate estimates, today it is possible to quite clearly verify the distances and volumes of mined rock mass. The advent of drones will make this work even more accurate, which will make it possible to better monitor the stages of work being performed and quickly manage the processes of preparing reserves for extraction. The presence of precise linking of equipment to a satellite map allows not only to increase productivity,

but also to prevent accidents, such as collisions, being in the sanitary protection zone of an explosion.

Firstly, this is the interpretation of the obtained geological exploration results. During their work, geologists select the most representative core samples to prepare reserve estimates; less valuable data, as a rule, is not properly processed. In-house geologists working on the company's main projects do not have enough time to analyze unpromising geological information, but the data can be outsourced. Secondly, the enterprise carries out operational exploration on a daily basis, which makes it possible to assess the characteristics of the ore body for the next couple of days of production, and this information sometimes helps to make significant adjustments to the work plan and understanding of the occurrence of the ore body. Previously, reviewing the field development model took several months and was carried out once a year, or even less often. Today, the increased capabilities of information systems, as well as the analysis of production exploration samples, can make changes to the development of a field model virtually on a weekly basis.

The costs of personnel training, especially in the case of underground mining, constitute a significant part of the enterprise's expenses. That is why the emergence of unmanned mining machines has become a new trend in the development of mining. The use of unmanned vehicles in hazardous work areas is especially important. Unfortunately, the mining and geological conditions of most Russian coal mines do not imply the use of underground machines due to the small width of the seam, however, the miniaturization of robotics in the future promises the emergence of solutions for such specific conditions.

Ore separation technologies are becoming increasingly widespread. If previously they worked mainly for radioactive elements, today, by combining different analysis techniques, it is possible to determine specific characteristics for almost any mineral that make it possible to separate rich ore from poor ore. The use of these technologies significantly reduces the cost of ore processing, which leads to significant savings and extends the life of equipment.

In terms of fuel consumption, large mining vehicles are comparable to army equipment, and even exceed its gluttony. The costs of a mining enterprise for fuel actually constitute the main item of its expenses. They tried to solve this problem for a long time; one of the interesting solutions was the use of dump trucks with electric motors, which were powered by a contact network, like a trolleybus or tram. Today, the main trend in increasing environmental friendliness is the conversion of mining equipment to gas. Considering the low cost of natural gas in our country, this direction looks quite promising.

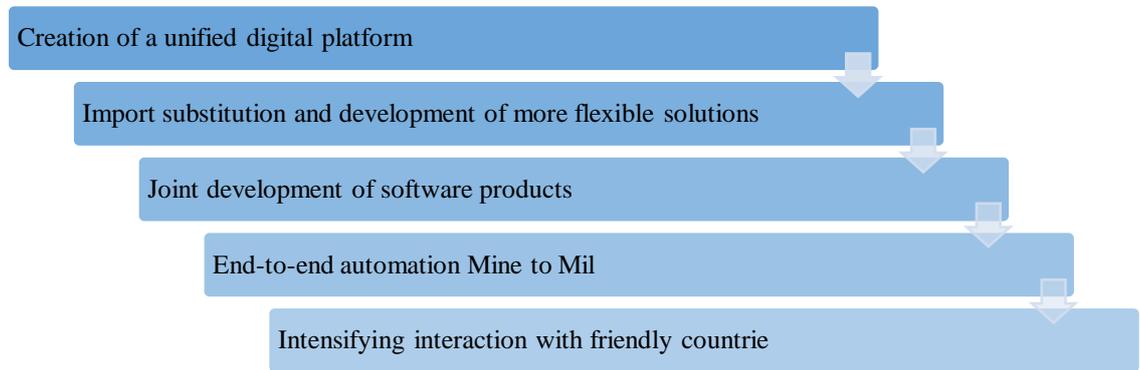
Biomining is the process of using microorganisms to extract metals from rocks or mines. Processing of refractory (for gold), lateritic (for nickel) ores or ores with impurities of harmful elements (arsenic) was previously very difficult due to the low yield of useful components or extremely harmful emissions.

The use of bacteria capable of processing certain elements allows us to solve this problem - for example, bacteria can significantly increase the degree of extraction of metals from rocks at relatively low costs of labor, energy and fixed capital. This makes it economically profitable to process low-grade ores and technogenic waste, and allows the extraction of metals from deep ores without damage to the landscape. By oxidizing sulfide ores, microbes dissolve metals (copper, iron, etc.) and facilitate the process of their extraction (bioleaching).

Preparation of raw materials. If previously the analysis of incoming raw materials presented significant difficulties, today metal detectors make it possible to quickly and efficiently separate non-ferrous metals from ferrous ones and use only high-quality scrap for smelting.

Precise control of the crystallization parameters of rolled products today makes it possible to control every millimeter of manufactured products, which sharply reduces the amount of defective and substandard products.

Although powder metallurgy has been a well-known technology for a long time, today the properties of computer-controlled crystallizers make it possible to produce products with significantly higher consumer properties.



**Figure 2.** IT trends in the mining and metallurgical industry for 2024 [3]

Full-fledged 3D printing of metal products is on the way, which was simply impossible before due to uneven cooling of the metal during printing.

Filters are in use. Every year, the environmental friendliness of production increases, filters are improved, technologies are developed for removing smoke and purifying used water, both through the use of the latest achievements of the chemical industry and through the achievements of biological science, which today is ready to grow bacteria capable of consuming and neutralizing almost any waste.

Product personalization. Digitalization has not spared the marketing sphere either: today steel can be purchased in a regular online store, after which you can track the purchase and competently manage inventory, focusing on expected deliveries.

Customization of metallurgy products is becoming a new trend, and perhaps in the future metallurgists will be ready to provide any consumer with products prepared for his specific needs.

### Homosexual

The development of wearable electronics has given a new purpose to lithium and cobalt, which have become indispensable elements of quickly rechargeable batteries. But the high cost of these metals is forcing battery manufacturers to look for new uses for long-known metals. Projects have already emerged that promise widespread use of aluminum in future batteries.

### Electrolysis as an example

The list of promising new products in the mining and metallurgical industries is not exhausted by the above-mentioned technologies. The metals mining and manufacturing industry is on the verge of a change comparable to the technological leap in aluminum production, when electrolysis transformed the expensive and previously unavailable metal into a widely used material. These changes are inevitable, and the increase in efficiency in mining and metallurgy, although frightening with the possible reduction of unskilled personnel, promises a large number of new jobs in the field of intellectual labor.

Almalyk Mining and Metallurgical Plant (AMMC) is one of the largest mining and metallurgical enterprises in our republic. Its production facilities are located in Tashkent, Jizzakh, Namangan and Surkhandarya regions.

Also, Almalyk MMC JSC is constantly working together with the Ministry of Economic Development and Poverty Reduction of the Republic of Uzbekistan on a number of promising energy-saving projects, the implementation of which will ensure energy efficiency of production.

The plant has rich reserves of porphyry copper, lead-zinc and gold-silver deposits, developed at the Kalmakyr and Kauldy mines, the Sary-Cheku quarry, the Angren and Chadak mines and at the Khandiza deposit.

The production volume of AGMK has increased in recent years from 5.4 trillion soums in 2017 to 30.5 trillion in 2022, an increase of 48%. The volume of product localization from 2017 to 2022 increased 9 times, from 34 billion soums in 2017 to 334 billion soums in 2022. During this period, more than \$824 million was invested in the development of the Plant, which is \$536 million more than 6 years ago. If in 2017 the total number of workers and employees of the enterprise was 30,781 people, then in 2022 it exceeded 34,800 people, having increased by 13% over the past 6 years.

If in 2017 the export of the company's products was about 634 million dollars, then in 2022 it will be 936 million dollars. Currently, the Plant sells 18 types of highly liquid export products. The main products are copper, zinc and molybdenum metal.

AGMK ranks third in the world after Russia and Kazakhstan in copper production. Copper production at AGMK increased from 39,000 tons in 2017 to 149,000 tons in 2022, zinc metal from 75 thousand tons to 90 thousand tons, molybdenum metal from 586 tons to 778 tons [7].

The Oliy Zie (combined Kalmakyr and Yoshlik-I mines) and Sary-Cheku porphyry copper deposits provide raw materials for the Company's copper chain and are processed at processing plants (MOF-1, MOF-2). During 2019-2021, AGMK, together with SRK Consulting, carried out work to assess reserves according to the JORC standard with the issuance of a mineral resource report (MRE) and a feasibility study.

The introduction of innovative developments will solve the following problems:

- rapid development of the mineral resource base, ensuring an increase in the growth of industrial reserves of minerals;
- reducing the cost of mining operations and the specific costs of materials and reagents, fuel, energy costs, operating costs for the maintenance of mining transport equipment;
- complete development of subsoil, comprehensive and economically rational extraction of minerals, taking into account environmental protection and safety of work;
- complex processing of gold, uranium and black shale ores;
- obtaining rare and rare earth metals;
- localization of technological equipment and spare parts;
- ensuring timely analysis and forecasting, timely response to prevent possible accidents and incidents at hazardous production facilities of AGMK;
- reducing the negative impact of the plant's production on the environment;
- increasing the range of export-oriented products;
- predicting and preventing the risks of developing occupational diseases.

Work is underway to implement priority tasks: this is the organization of the activities of an electronic cooperative portal, industrial fairs in order to attract business entities;

providing detailed information about the type, technical characteristics and quality indicators of industrial products produced in the republic.

#### 4. Conclusion

The findings of this study highlight the critical role of targeted innovations in enhancing the productivity and competitive positioning of industrial enterprises. By employing a mixed-methods approach, the research identified key factors that influence successful innovation implementation, emphasizing the need for strategic alignment of innovations with enterprise objectives. The results underscore the importance of a robust innovation management framework, which is essential for enterprises aiming to achieve sustainable growth and maintain a competitive edge in the global market. These insights have significant implications for policymakers and business leaders, suggesting that fostering a dynamic innovation ecosystem is crucial for economic development. Further research is recommended to explore the long-term impact of these innovation strategies and to develop more refined tools for assessing and managing innovative potential in industrial enterprises.

#### REFERENCES

- [1] A. Khasanshin, A. A. Kudryashov, E. V. Kuzmin, and A. A. Kryukova, *Digital Economy. Textbook for Universities*, I. A. Khasanshin, Ed. Moscow: PGUTI, 2019, p. 288.
- [2] L. V. Lapidus, *Digital Economy: Electronic Business and Electronic Commerce Management: Monograph*. Moscow: INFRA-M, 2018, p. 381.
- [3] S. Wootton and Home, *Strategic Planning: The Nine Step Program*. Kogan Page, 2014, p. 128.
- [4] A. A. Yakushev and A. V. Dubynina, *Innovative Economy*. Moscow: Finance and Statistics, 2017, p. 264.
- [5] "Government Portal of the Republic of Uzbekistan," [www.gov.uz](http://www.gov.uz).
- [6] "National Database of Legislation of the Republic of Uzbekistan," [www.lex.uz](http://www.lex.uz).
- [7] "Ministry of Finance of the Republic of Uzbekistan," [www.mf.uz](http://www.mf.uz).
- [8] "Information and Legal Portal of Uzbekistan," [www.norma.uz](http://www.norma.uz).
- [9] "Press Service of the President of the Republic of Uzbekistan," [www.press-service.uz](http://www.press-service.uz).
- [10] O. Gassmann, K. Frankenberger, and M. Csik, *The Business Model Navigator: The Next Step in Business Model Innovation*. Pearson, 2020.
- [11] J. Tidd and J. Bessant, *Managing Innovation: Integrating Technological, Market and Organizational Change*. Wiley, 2020.
- [12] M. Bogers, H. Chesbrough, and C. Moedas, "Open Innovation: Research, Practices, and Policies," *California Management Review*, vol. 60, no. 2, pp. 5-16, 2018.
- [13] J. Birkinshaw, A. Zimmermann, and S. Raisch, "How Do Firms Adapt to Discontinuous Change? Bridging the Dynamic Capabilities and Ambidexterity Perspectives," *California Management Review*, vol. 58, no. 4, pp. 36-58, 2016.
- [14] M. Wenzel, S. Stanske, and M. B. Lieberman, "Strategic Responses to Crisis," *Strategic Management Journal*, vol. 41, no. 3, pp. 617-652, 2020.
- [15] Y. Li, M. Hou, H. Liu, and Y. Liu, "Improving the Innovation Performance of SMEs through Servitization: The Mediating Role of Exploratory Learning and Exploitative Learning," *Industrial Marketing Management*, vol. 89, pp. 1-11, 2020.
- [16] K. S. R. Warner, "Building Dynamic Capabilities for Digital Transformation: An Ongoing Process of Strategic Renewal," *Long Range Planning*, vol. 52, no. 3, pp. 326-349, 2019, doi: 10.1016/j.lrp.2018.12.001.
- [17] X. Cai, "Can Direct Environmental Regulation Promote Green Technology Innovation in Heavily Polluting Industries? Evidence from Chinese Listed Companies," *Science of the Total Environment*, vol. 746, 2020, doi: 10.1016/j.scitotenv.2020.140810.
- [18] D. Zhang, "Green Innovation and Firm Performance: Evidence from Listed Companies in China," *Resources, Conservation and Recycling*, vol. 144, pp. 48-55, 2019, doi: 10.1016/j.resconrec.2019.01.023.

- 
- [19] K. Y. H. Lim, "A State-Of-The-Art Survey of Digital Twin: Techniques, Engineering Product Lifecycle Management and Business Innovation Perspectives," *Journal of Intelligent Manufacturing*, vol. 31, no. 6, pp. 1313-1337, 2020, doi: 10.1007/s10845-019-01512-w.
- [20] X. Ouyang, "How Does Environmental Regulation Promote Technological Innovations in the Industrial Sector? Evidence from Chinese Provincial Panel Data," *Energy Policy*, vol. 139, 2020, doi: 10.1016/j.enpol.2020.111310.
- [21] Y. Bai, "The Impacts of Government R&D Subsidies on Green Innovation: Evidence from Chinese Energy-Intensive Firms," *Journal of Cleaner Production*, vol. 233, pp. 819-829, 2019, doi: 10.1016/j.jclepro.2019.06.107.
- [22] S. Feng, "Environmental Decentralization, Digital Finance and Green Technology Innovation," *Structural Change and Economic Dynamics*, vol. 61, pp. 70-83, 2022, doi: 10.1016/j.strueco.2022.02.008.
- [23] K. Tang, "Does Command-And-Control Regulation Promote Green Innovation Performance? Evidence from China's Industrial Enterprises," *Science of the Total Environment*, vol. 712, 2020, doi: 10.1016/j.scitotenv.2019.136362.
- [24] K. Shirvanimoghaddam, "Death by Waste: Fashion and Textile Circular Economy Case," *Science of the Total Environment*, vol. 718, 2020, doi: 10.1016/j.scitotenv.2020.137317.
- [25] N. Shen, "Different Types of Environmental Regulations and the Heterogeneous Influence on the Environmental Total Factor Productivity: Empirical Analysis of China's Industry," *Journal of Cleaner Production*, vol. 211, pp. 171-184, 2019, doi: 10.1016/j.jclepro.2018.11.170.