

Research on Key Points of Design of Standard Plants in Modern Industrial Parks Under the Background of Promoting the Development of New Quality Productive Forces

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Abstract: With the progress of science and technology and the acceleration of industrialization, the modern industrial park is an important carrier of industrial development. The importance of its standard plant design has become increasingly prominent. With the development of new quality productive forces as the background, this research deeply discusses the key points of standard plant design in modern industrial parks. This paper uses literature review and case analysis to systematically analyze the important role of standard plant design in developing new quality productive forces in modern industrial parks and puts forward suggestions for optimizing design. It is found that the rationality, intelligence, and environmental protection of plant design are the key factors affecting the development of new quality productive forces. The paper summarizes the core points of modern industrial park standard plant design to provide a reference for the future development of related industries.

Keywords: New quality productive forces; Modern industrial park; Standard plant design; Intelligent; Environmental protection

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1. Introduction

With the continuous development of the global economy, science, and technology, new quality productive forces have become a key driving force to promote economic growth. With technological innovation and industrial upgrading as the core, the new quality productive forces have the characteristics of strong technological innovation, obvious industrial upgrading, high production efficiency, and optimization of production structure. It is an important force to promote sustainable, healthy, and high-quality economic and social development. It is also an important leading force to guide the future development direction of productivity. As an important carrier of new quality productive forces, a modern industrial park's standard plant design is prominent for improving production efficiency, reducing cost, and promoting sustainable development. Modern industrial

parks play an important role in developing new quality productive forces such as gathering innovative resources, promoting industrial upgrading, providing efficient services, cultivating emerging industries, and strengthening international cooperation ^[1].

With the continuous development of new quality productive forces, modern industrial parks will continue to give play to their unique advantages and inject new vitality into economic and social development. This study uses various research methods, such as literature review and case analysis. By reviewing local and international literature, the latest theoretical and practical achievements in the standard plant design of modern industrial parks were understood. Additionally, through case analysis, the successful experiences and existing problems of typical modern industrial parks were analyzed. Through in-depth research on the design of standard workshops in modern industrial parks, key design factors affecting the development of new quality productive forces are identified. Optimization suggestions, aligned with the development trends of modern industry, are proposed to provide theoretical support and practical guidance for improving new quality productive forces and optimizing industrial structure.

2. Definition and characteristics of new quality productive forces

2.1. Definition of new quality productive forces

New quality productive forces are those that enhance production quality and efficiency through scientific, technological, institutional, and management innovations. It represents a brand new and high-quality development model, aiming to realize the transformation of economic growth mode and optimize economic structure. The core symbol of new quality productivity lies in its innovation and efficiency. Innovation is reflected in continuously adopting new technologies, processes, and formats to promote the production process's intelligence, greening, and flexibility. Efficiency is reflected in the optimization of the allocation of production factors and the improvement of input-output efficiency, which realizes the double improvement of the quality and efficiency of economic growth. The key to new quality productivity lies in innovation drive. Through scientific, technological, institutional, and management innovation, we will break away from traditional development models and promote the rapid advancement of productive forces. Simultaneously, it is necessary to strengthen the support of talents and cultivate a high-quality and innovative workforce. The essence of new quality productivity lies in upgrading and transforming productivity. The emergence of new productive forces marks another historic leap in developing productive forces in human society ^[2].

2.2. Characteristics of new quality productive forces

Compared with the traditional productive forces, the new quality productive forces rely on technological breakthroughs and innovation to improve productivity that is characterized by strong technological innovation, obvious industrial upgrading, high production efficiency, and optimized production structure (as shown in **Figure 1**). The specific characteristics of new quality productive forces are as follows:



Figure 1. Characteristics of new quality productive forces

(1) Strong technological innovation

New quality productive forces take technological innovation as the core and constantly promote technological progress and application innovation. This includes the introduction of advanced production technologies, processes, and equipment, improving the automation and intelligence level of the production process, as well as the development and application of new technologies, new processes, and new materials. Technological innovation is the fundamental driving force of new quality productive forces and the key to its difference from traditional productivity.

(2) Obvious industrial upgrading

New quality productive forces focus on both technological innovation in individual production steps and the overall upgrading of the industrial chain. This involves transforming traditional industries to become high-end, intelligent, and green, developing emerging industries, and promoting integration and coordinated development among various sectors. Industrial upgrading is an important embodiment of new quality productive forces and an important means to promote the optimization and upgrading of economic structure.

(3) High production efficiency

New quality productive forces significantly enhance production efficiency through technological innovation and industrial upgrading. This includes reducing energy and material consumption, lowering labor costs, improving product quality and added value, and shortening the product development to market cycle. Improved production efficiency is a key goal of new quality productive forces and a crucial support for promoting economic and social development ^[3].

(4) Production structure optimization

The new quality productive forces are committed to optimizing the production structure and promoting the transformation and upgrading of the industrial structure. This includes developing new industries such as high-tech industries, green economy, and modern service industries, transforming and upgrading traditional industries, and promoting the coordinated development of regional industries. The optimization of production structure is one of the important tasks of new quality productive forces and the key to promoting the sustainable development of the economy and society.

3. The role of modern industrial parks in the development of new quality productive forces

With the continuous progress of science and technology and the profound adjustment of global industrial structure, new quality productive forces have become the core driving force for economic and social development. In this context, modern industrial parks play an increasingly important role as an important platform for centralized display and cultivation of new quality productive forces. The following are some key roles of modern industrial parks in the development of new quality productive forces (as shown in **Figure 2**).

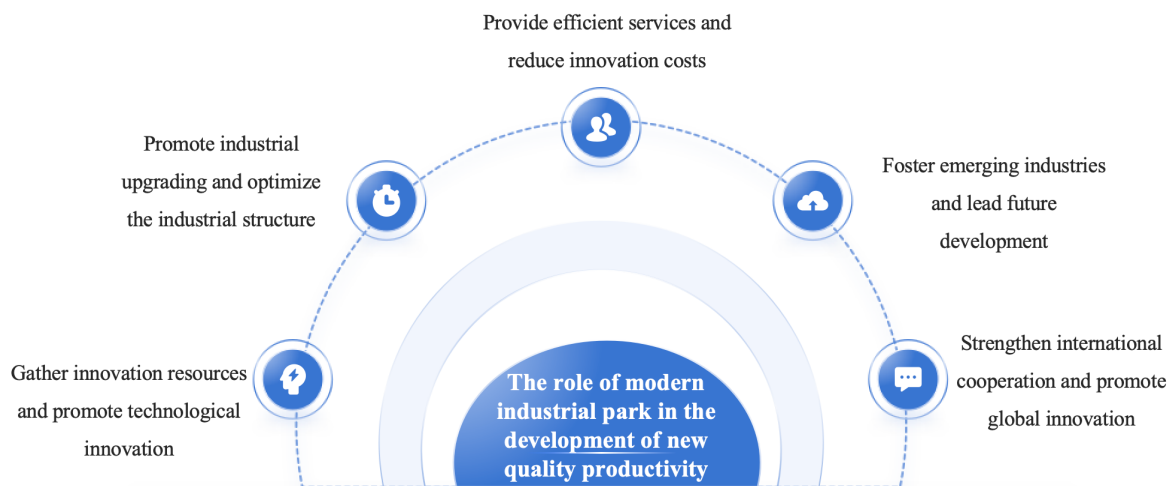


Figure 2. Key roles of modern industrial parks in the development of new quality productive forces

3.1. Gather innovation resources and promote technological innovation

Modern industrial parks usually gather a large number of research and development institutions, universities, innovative enterprises, and other innovative resources. These resources, through cooperation and exchange, form a strong innovation force. Enterprises in the park can make full use of these innovative resources to carry out technological research and development, product innovation, and other activities, to promote the formation and development of new quality productive forces ^[4].

3.2. Promote industrial upgrading and optimize industrial structure

Modern industrial parks often take a leading industry or industrial chain as the core and promote the overall upgrading of the industry by introducing and cultivating high-quality enterprises and optimizing the industrial chain structure. This not only improves the production efficiency of enterprises in the park but also optimizes the industrial structure and provides strong support for the development of new quality productive forces.

3.3. Provide efficient services and reduce innovation costs

Modern industrial parks usually have the advantages of perfect infrastructure and efficient government services, providing enterprises with a good environment for innovation. Enterprises can enjoy convenient services such as policy consultation, financing support, and personnel training in the park, which reduces innovation costs and improves innovation efficiency.

3.4. Foster emerging industries to lead future development

The modern industrial park not only focuses on the transformation and upgrading of traditional industries but also focuses on the cultivation and development of emerging industries. Through the introduction and cultivation of emerging industrial enterprises and the construction of relevant innovation platforms, modern industrial parks have injected new vitality into the sustainable development of new quality productive forces.

3.5. Strengthen international cooperation and promote global innovation

Modern industrial parks are usually characterized by openness and internationalization. This is done by strengthening cooperation and exchanges with international innovation resources, introducing international advanced technology and management experience, promoting the integration and sharing of global innovation

resources, and providing broader space and opportunities for the development of new quality productive forces.

4. The development trend of modern industrial parks under the background of new quality productive forces

4.1. Transformation and upgrading of industrial structure

Firstly, driven by new quality productive forces, modern industrial parks will pay more attention to the development of high-tech industries. The high-tech industry, with its high added value, high innovation, and high growth characteristics, has become an important engine to promote the transformation and upgrading of modern industrial parks. The park will actively introduce and cultivate high-tech enterprises, build high-tech industrial clusters, and enhance overall industrial competitiveness. Secondly, the modern industrial park will pay more attention to the collaboration and innovation cooperation of the industrial chain. By strengthening the cooperation and exchanges between upstream and downstream enterprises in the industrial chain, the integration and optimization of the industrial chain are promoted, improving overall industrial competitiveness. Thirdly, the park will also actively build an innovation platform, promoting integration between industry, university, and research, fostering the cooperation of innovation resources, and providing strong support for the transformation and upgrading of industrial structures. Fourthly, with the acceleration of globalization, modern industrial parks will pay more attention to internationalization and global development. The park will actively introduce international advanced technology and management experience, strengthen cooperation and exchange with international innovation resources, and promote the international development of the industry. Finally, the park will also actively participate in the global industrial division of labor and cooperation to promote the global layout and development of the industry (as shown in **Figure 3**).

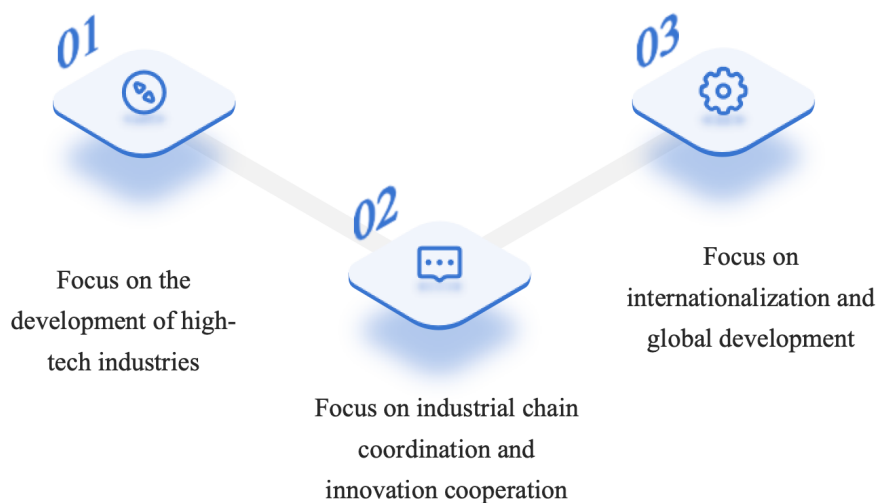


Figure 3. Future industrial development trends

4.2. Application of intelligent technology

With the rise of new quality productive forces, intelligent technology is gradually becoming the core driving force for the development of modern industrial parks. Modern industrial parks are actively introducing and cultivating intelligent production lines to improve production efficiency and product quality through automation, information technology, and intelligent technical means. The popularization of intelligent production lines will help reduce production costs and human error, and provide enterprises with more accurate and efficient

production methods. Concurrently, the Internet of Things technology is the key to achieving equipment interconnection and intelligent production. The modern industrial park will widely use this technology to connect various devices to form an intelligent system and realize the interconnection between devices. Through the application of the Internet of Things technology, enterprises can monitor the operating status of equipment, production data, and other information in real-time, providing strong support for production decisions. Additionally, artificial intelligence, as one of the fastest-developing technologies in the current field of intelligence, is achieving deep integration with modern industrial parks. The modern industrial park will use artificial intelligence technology to realize the rapid processing and analysis of big data and predict future trends according to the trend of the data. In the production planning and material management of enterprises, artificial intelligence will play an important role in helping enterprises achieve intelligent management and decision-making. Cloud computing technology can integrate and manage the data of various enterprises to achieve centralized data management and sharing. The modern industrial park will widely use cloud computing technology to provide enterprises with efficient and convenient data storage, analysis, and application services. Through the application of cloud computing technology, enterprises can improve data utilization efficiency, reduce data management costs, and further improve the overall efficiency and management level of enterprises. Finally, with the continuous development of intelligent technology, the modern industrial park will establish a more perfect intelligent service system. This system will cover intelligent consulting, intelligent training, intelligent maintenance, and other aspects to provide enterprises with a full range of personalized intelligent services. Through the establishment of an intelligent service system, the modern industrial park will further enhance the intelligent level of enterprises and promote the sustainable development of new quality productive forces (as shown in **Figure 4**).

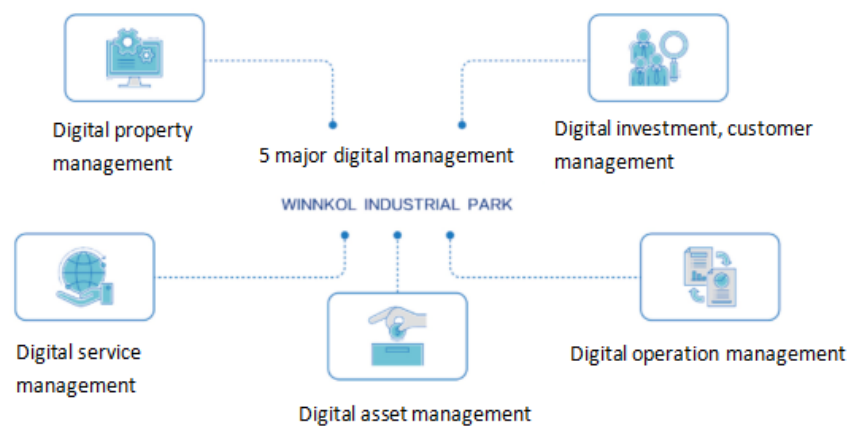


Figure 4. New quality productive forces contribute to the digital management of industrial parks

4.3. Green and sustainable development concept

With the rise of new quality productive forces, the concept of green sustainable development is gradually becoming the core guiding ideology of modern industrial park development. Modern industrial parks are vigorously promoting green production methods to reduce the impact of industry on the environment by adopting advanced energy-saving and emission-reduction technologies and improving resource utilization efficiency. At the same time, the park also encourages enterprises to carry out a circular economy, achieve waste reduction, resource, and harmless treatment, and promote the coordinated development of industry and the environment. Simultaneously, the modern industrial park pays attention to the construction of green buildings and promotes the design, construction, and operation of buildings in the park following green

building standards. Green buildings use energy-saving, environmentally friendly, and sustainable materials and technologies to reduce the impact of buildings on the environment, improve the energy efficiency and comfort of buildings, and create a greener and healthier working and living environment for enterprises and employees in the park. Moreover, the modern industrial park attaches great importance to the protection and management of the ecological environment and takes a series of measures to protect it. The park will strengthen ecological restoration and environmental governance, promoting biodiversity and ecological environment protection. The park also pays attention to the monitoring and assessment of the environment to promptly identify and address environmental issues, ensuring continuous improvement of the ecological quality of the park. Furthermore, the modern industrial park prioritizes green supply chain management, encouraging enterprises and suppliers to collaborate on achieving green procurement, production, and logistics. This optimizes supply chain management to reduce the environmental footprint and impact of products. Lastly, the park encourages enterprises to carry out green certification and labeling and promote the popularization and application of green products. By organizing green theme activities, training, and other awareness programs, enterprises and employees will engage in environmental protection activities, fostering a green, low-carbon, environmentally friendly production and lifestyle.

5. Analysis of key points of modern industrial park standard plant design

5.1. Reasonable function layout

The functional layout of the standard factory should fully consider the production process, material flow, personnel flow, and other factors to ensure that the production process is smooth and efficient. A reasonable functional layout can not only improve production efficiency, but also reduce the ineffective movement of materials and personnel, and reduce production costs. The standard plant design should fully consider the needs of logistics and people flow, set up reasonable channels, freight elevators, people flow channels, etc., to ensure the smooth flow of traffic ^[5].

5.2. Environmental protection and energy-saving requirements

Modern industrial park standard plant design should follow the principle of environmental protection and energy saving. The use of advanced energy-saving technology and equipment such as energy-efficient air conditioning systems, lighting systems, energy-saving building materials, etc., can reduce energy consumption and pollution. Concurrently, the plant design should also consider the use of natural conditions such as natural ventilation and lighting to reduce the dependence on artificial energy. In addition, the choice of building materials directly affects the service life, safety, and environmental performance of the plant. The standard plant design should choose high-performance and environmentally friendly building materials, such as external wall materials with strong weather resistance and internal wall materials with good thermal insulation performance to improve the overall performance of the plant ^[6].

5.3. Safety specifications

Safety is the top priority in plant design. Standard plant design should meet the national and industry-related safety specifications and standards to ensure the safety of plant structure, fire safety, electrical safety, and other requirements. Furthermore, the factory should also set up safety facilities and signs to improve the safety awareness of employees. Based on safety standards, space utilization efficiency is one of the important indicators to measure the design level of a plant. Standard plant design should fully consider the use of space, through reasonable column network layout, floor height design, equipment layout and other means to improve

the space utilization efficiency of the plant.

5.4. Complete equipment

The modern industrial park should be equipped with perfect production equipment and living facilities to meet the needs of production and staff life. Production equipment should be advanced and efficient equipment to improve productivity. Living facilities such as restaurants, rest areas, bathrooms, etc. should be fully equipped to meet the basic living needs of employees. Moreover, it is also necessary to consider humanized design. Plant design should fully consider the physiological and psychological needs of employees, and create a comfortable and healthy working environment. For example, setting up reasonable lighting and ventilation systems, providing comfortable working temperature and humidity, setting up staff rest areas, etc., to improve staff efficiency and satisfaction ^[7].

6. Conclusion

In summary, the development trend of modern industrial parks under the background of new quality productive forces shows that high-tech industries are led by green and sustainable development, digital transformation and intelligent upgrading, industrial chain coordination and innovation cooperation, and internationalization and globalization. These trends will jointly promote the transformation and upgrading of the industrial structure of modern industrial parks and inject new vitality into economic and social development. The main points of modern industrial park standard plant design involve many aspects, which need to consider factors such as functional layout, environmental protection and energy saving, safety norms, traffic flow, building materials, equipment support, space utilization, and humanized design. Through scientific and reasonable design, it can create an efficient, environmentally friendly, and safe modern industrial park standard factory building to provide strong support for industrial development. With the development of new quality productive forces as the background, this research deeply discusses the key points of standard plant design in modern industrial parks. Through literature review and case analysis, it is concluded that standard plant design of modern industrial parks plays an important role in developing new quality productive forces. At the same time, the key points of plant design should pay attention to reasonable layout, intelligent design, green environmental protection, flexibility, and scalability. These suggestions have important guiding significance for the construction and development of modern industrial parks in the future.

Disclosure statement

The author declares no conflict of interest.

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