

# A Review of Research on Intelligence and High-Quality Development of Enterprises

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**Abstract.** The development of intelligence in China is in full swing, and it is at the world 's leading level in many fields. Guided by the scientific judgment of the government work report ' promoting the deep integration of the Internet, big data, artificial intelligence and the real economy ', the deep integration with intelligence is an important starting point for achieving high-quality economic development in China. The realization of high-quality development of micro-enterprises is an important prerequisite and basic guarantee for high-quality development at the macro level. It is undoubtedly an important issue to study intelligent technology and high-quality development of micro-enterprises in the new era. In recent years, scholars at home and abroad have made extensive explorations in the economic effects of artificial intelligence, the influencing factors of high-quality development of enterprises, and intelligent ' enabling ' high-quality development, which have contributed important results with reference value and significance to the study of intelligent and high-quality development of enterprises. This paper reviews and summarizes this, in order to provide some help for the high quality development of enterprises.

## 1. Introduction

According to the 20th National Congress of the Communist Party of China, constructing a modern socialist country's primary objective is to achieve high-quality development. The party prioritizes development as the key factor for governing and revitalizing the nation, emphasizing the need to promote high-quality development by improving total factor productivity and balancing quantity and quality. To achieve high-quality economic development, the key lies in building a modern industrial economic system and enhancing the quality and efficiency of the supply system. Scientific and technological innovation and total factor productivity improvement are essential drivers of this progress. Science is an important internal driving force for development. Intelligentization is a new stage of China 's digital and networked development, showing two characteristics of " industrial intelligence " and " intelligent industrialization. " The former emphasizes that intelligence runs through all aspects of design, production, management and service. On the basis of traditional automation replacing manual workers ' human-machine collaborative flexible production, it forms competition with knowledge workers, widely penetrates into various industries, breaks the bottleneck of traditional production factor supply constraints, and focuses on cross-industry integration. The latter focuses on the innovative application of intelligent technology in the fields of design patterns, production intelligent decision-making, etc., Through professional division of labor and cross-industry integration of agglomeration

effects, it guides the flow of factors from low-efficiency departments to high-efficiency departments, releases social idle resources, optimizes resource allocation, and promotes enterprise innovation. Since the release and full implementation of the ' Made in China 2025 ' guidance document, intelligence has been widely used in enterprises and achieved rapid development. More and more enterprises use intelligent technology to achieve their own development and structural transformation. Accordingly, with the birth of intelligent pilot enterprises deployed by the state, the information disclosure system of enterprise intelligence is becoming increasingly perfect and standardized, which lays a solid data foundation for the research related to intelligence.

Promoting intelligence and high-quality development of enterprises is a dual task faced by enterprises in the process of growth. Is there a connection between the two ? What is the connection ? How does intelligence affect the high-quality development of enterprises ? Although a considerable number of scholars believe that compared with traditional automation technology, intelligent technology has realized man-machine collaborative innovation. Technical methods like big data analysis, machine learning, and intelligent algorithms are utilized to minimize subjective behavior bias, resulting in a significant alignment of production supply and consumption demand. Such docking can effectively promote high-quality development of enterprises. However, some studies believe that there is a productivity paradox, and new technologies and new production methods such as artificial intelligence and intelligence may reduce productivity, thus hindering the

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high-quality development of enterprises (Guo Min, 2018)[1]. China's economic development has entered a new mode of business, these two conclusions are contradictory. The traditional approach of relying on abundant labor resources to achieve sustainable and high-quality development through high investment and high export is no longer feasible. Enterprise transformation and upgrading, particularly through the adoption of intelligent technologies, is vital to drive high-quality development. Therefore, exploring current research on intelligence and high-quality development in enterprises is undoubtedly of great importance in the new era, both theoretically and practically.

## 2. Connotation of intelligence.

The proposal and deepening of the concept of intelligence, to a certain extent, comes from the innovation and development practice of American manufacturing industry. As early as 1973, Joseph Harrington proposed the concept of "computer integrated manufacturing," but did not attract much attention. In 1984, Harrington published a book "Understanding the manufacturing process: the way to success in implementing CAD / CAM," which attracted the attention of the American Society of Engineers. In 1985, the American Society of Engineers began to recommend computer integrated manufacturing, and proposed the concept and framework of "embedded system." In 1993, the United States released 'Information Technology and Manufacturing: A Discussion Paper on Research Needs'; in 1994, the United States formulated the '21st Century Manufacturing Enterprise Strategy', proposed the 'Agile Manufacturing' strategy, and formed a core research team composed of more than 100 companies and representatives of the Department of Defense, focusing on agile technology that takes into account the special interests of the Department of Defense and the economic interests of the industry.

Enterprise intelligence is mainly manifested in the application of new technologies such as artificial intelligence, cloud computing, big data, Internet of Things, and blockchain in the production and sales process (Deng Yue and Jiang Wanyi, 2022)[2]. With the continuous development of artificial intelligence, information technology and network technology, the concept and connotation of intelligence are constantly changing, enriching and improving. Kusiak (1990) proposed from the perspective of intelligent function that intelligence refers to the creative behavior that makes decisions and implements through computer simulation of human mental activities in the production process[3]. Intelligence aims to replace or develop one's mental and physical strength. From the perspective of intelligent market expansion, According to Davis et al. (2012), intelligence aims to enhance product production and trading through the utilization of high and new technology, improving the flexibility of the production process to adapt to the dynamic global market[4]. Meanwhile, Zhou Jiajun et al. (2015) argue that

intelligence, from a technical standpoint, refers to the combination of information technology and artificial intelligence, and the use of perception, human-computer interaction and other similar human operations to design, manufacture, management and maintenance of products and other innovative behaviors[5]. Wang (2015) proposed from the perspective of production link correlation that enterprise intelligence is the manufacturing behavior of realizing 'cyber physical system' in the factory, realizing 'interconnected manufacturing' between factories, and realizing 'data manufacturing' outside the factory[6]. From the viewpoint of system integration, Lu Tie et al. (2015) proposed that the intelligent foundation is a new generation of information technology, aiming at process energy saving and emission reduction and high product performance, and a general term for advanced production processes, systems and models with intelligent perception and execution functions[7]. In 2016, the Chinese Ministry of Industry and Information Technology and the Ministry of Finance published a plan for the development of intelligent manufacturing from 2016 to 2020. According to the plan, intelligent manufacturing integrates advanced manufacturing technologies with modern information and communication technologies to enhance every aspect of production, including design, manufacturing, management, and services. It is distinguished by its abilities to perceive, learn, decide, execute, and adapt on its own. From the viewpoint of the manufacturing value chain, Han Jiangbo (2017) proposed that intelligence is a creative behavior that intelligent technology penetrates into each link of the manufacturing value chain and 'blurs' the stage boundaries, and manual labor is gradually replaced by intelligence to realize the innovation and upgrading of the manufacturing value chain[8]. 'Made in China 2025' regards the intelligence of enterprises as the 'nose' of the close integration of information and industrialization. In the context of the new situation, intelligence is a process that encourages enterprises to reintegrate data and production conditions and introduce them into the entire production system, forming an ecological closed loop of people, machines and things, through a variety of methods to promote the intelligent transformation and upgrading of enterprises, so as to improve productivity.

## 3. The connotation of high-quality development of enterprises

The most prominent feature of high-quality development is the emphasis on "quality." Different from the previous attention to simple increment, "quality" in development quality is a relatively complex concept. The achievement of high-quality development does not solely depend on macro-level opportunities but also requires attention to development at the meso and micro levels. Promoting high-quality development at the meso and micro levels is the key to driving high-quality macroeconomic development. In order to understand the essence of high-quality development in enterprises, it is

necessary to define the concept of high-quality development accurately. The research team at the National Development and Reform Commission's Economic Research Institute believes that high-quality development is characterized by high quality, efficiency, and stability. Jin Bei (2018) pointed out that high-quality development is different from high-speed growth and is consistent with the five major new development concepts[9]. Meanwhile, Ren Baoping and Li Yumo(2018) focus on the macro level and describe high-quality development as high-quality economic development, ecological environment, and people's livelihood[10]. He Xiaoyu and Shen Kunrong(2018) believe that high-quality development is a new approach that prioritizes quality and efficiency[11]. Wang Yiming(2020) identifies the principal tasks and objectives of the high-quality development phase as achieving quality catch-up, structural upgrading, innovation-driven growth, green development, and promoting common prosperity that benefits everyone[12].

Similar to high-quality development, high-quality development of enterprises is also a new development trend different from the rapid development of enterprises, that is, enterprises are in a state of high-level and high-level development, and aim at sustainable development and sustainable value creation (Huang et al., 2018)[13]. Qi Jia (2019) believes that the high-quality development of enterprises is the development of enterprises with fast growth, strong innovation ability, great development potential, and intensive talent and technology[14]. When constructing the high-quality development evaluation system of state-owned enterprises, Yang Bo (2019) pointed out that the evaluation indicators should include the efficiency and efficiency of enterprises, independent innovation ability, transformation and open development ability, risk control ability and so on[15]. Huang Sujian et al. (2018) believe that the characteristics of high-quality development of enterprises include excellent comprehensive performance, outstanding resource capacity, good social reputation and effective management mechanism[13]. Dai Guobao and Wang Yaqiu (2019) studies private medium, small and micro enterprises, and believes that the essence of high-quality development of private medium, small and micro enterprises is to rely on the power of innovation and integrate external resources, improvement of product quality, transparent and open operation, and wealth sharing with stakeholders[16]. To sum up, high-quality development of enterprises should require enterprises to broaden their external horizons, coordinate the allocation of internal and external resources from the perspective of enterprises themselves, stakeholders and society, and consider all aspects, rather than only taking the maximization of their own interests as the starting point as before. Its biggest feature is to pursue higher efficiency, more effective supply, higher structure, greener and more sustainable production and more harmonious development.

## 4. Research on intelligence and high-quality development of enterprises

In the rapidly developing current society, transitioning from high-speed growth to high-quality development is crucial, and achieving high-quality economic development requires the corresponding development of high-quality enterprises. However, there is still no consensus on whether intelligence can significantly improve the production efficiency of enterprises and help enterprises achieve high-quality development.

Acemoglu and Restrepo (2018) believe that intelligent transformation will significantly enterprise resource utilization efficiency[17]. The intelligent production technology used by enterprises can promote human-machine collaboration, integrate various production links to greatly reduce costs, improve the total factor productivity of enterprises, and achieve high-quality development. Zhou Wenhui et al. (2018) pointed out that intelligent manufacturing will effectively promote the high-quality development of enterprises by reconstructing the boundary of man-machine, building a communication platform of the whole industrial chain, promoting the precise docking of production factors and sharing capacity of manufacturing enterprises through data exchange, providing more convenient and advanced modern communication technology for manufacturing enterprises, and accurately grasping customer needs[18]. Huang et al. (2019) pointed out that the development of Internet intelligent technology has improved the overall production efficiency of the city and the productivity of manufacturing enterprises by reducing transaction costs, reducing the frequency table of resource mismatch and promoting enterprise innovation, and the impact on the latter is much greater than the former[19]. Wen Huwei and Zhong Qiming (2021) used the data of listed manufacturing enterprises from 2009 to 2018 as samples. The research shows that the higher the intelligence level of manufacturing enterprises, the higher the total factor productivity level[20]. The intelligent productivity paradox is not established in manufacturing enterprises. In particular, the productivity effect is more obvious in companies with scarce human capital, labor-intensive and poor operating conditions. Song Min et al. (2021) constructed a new regional financial technology measurement index based on data from companies listed in Shanghai and Shenzhen from 2011 to 2018, and found that intelligent technology represented by financial technology will significantly improve its development quality[21]. In the analysis of the impact path, the article believes that the intelligent technology represented by fintech will greatly ease information is mixed between companies and outside agencies, so as to significantly promote the quality of enterprise development. This role is more significant in non-state-owned enterprises and places with low levels of market economy development. Other scholars put forward different views. Intelligentization has been widely questioned by the 'productivity paradox' in academia, which holds that people are too optimistic about intelligentization, and its emergence has not had a positive substantive impact.

Gordon (2017) found that most of the technological innovations are not mature enough to have an impact on enterprises. Therefore, the excessive use of intelligent manufacturing and unbalanced resource allocation will greatly limit the growth of total factor productivity and inhibit the development of enterprises[22]. On the domestic side, Li Bin (2010) found that the level of enterprise intelligence measured by R & D innovation in China did not promote the high-quality development of enterprises, but had a restraining effect[23]. Sun Xiaohua and Wang Yun (2014) proposed that R & D investment has a ' U-shaped ' impact on total factor productivity through empirical research[24]. Guo Min and Fang Mengran (2018) applied practical experience at the international level for further research, blaming the lag effect of productivity as the main reason for the ' productivity paradox '[1].

Under the trend of " machine substitution, " scholars generally believe that technological innovation plays an pivotal role in the course of intelligent promotion of high-quality development of enterprises. Wei Wei (2020) found through provincial panel data research that industrial intelligence can improve production technology, form large-scale production, and promote total factor productivity[25]. When industrial intelligence continues to develop, the increase in the proportion of low-skilled labor force will have a very important impact on total factor productivity. Based on the analysis of enterprise survey data, Cheng and Yuan (2020) showed that the use of robots will promote the quality improvement of enterprises through technological innovation[26]. The research of Liu and Sun (2021) shows that in industries with high penetration of artificial intelligence, digital import has a more obvious incentive effect on enterprise innovation, which further confirms the synergistic innovation effect of artificial intelligence and digital import[27]. Zhou et al. (2021) used the research results of Internet penetration rate and application rate to find that ' Internet + ' promoted the independent innovation of high-tech industry by improving the degree of market competition, and played the advantages of the industry to provide core competitiveness for the high-quality development of enterprises[28].

## 5.Conclusions

By combing the literature in related fields at home and abroad, this paper finds that domestic and foreign researchers use different samples and perspectives to empirically analyze the impact of intelligence on high-quality development, and the research results are reasonable. But in reality, there are still some gaps. Domestic and foreign scholars have extensively analyzed the relationship between intelligence and the high-quality development of enterprises. While most research suggests that a higher level of intelligence in enterprises promotes their development, there are still limitations to understanding the impact of intelligence. One such limitation is the lack of micro-level studies on the influence of intelligence on high-quality development of

enterprises since the release of 'Made in China 2025'. Most scholars have explored this relationship at a macro level, evaluating the impact of intelligence on economic development at the national, regional, and industrial levels through the use of an evaluation index system. However, these findings have limited reference value for understanding the impact of intelligence at the enterprise level. At the same time, the research on intelligence mainly focuses on industrial enterprises and manufacturing enterprises, and there are few articles involving common representative enterprises, which is worthy of further exploration. At the same time, it does not reflect the innovative characteristics brought by the progress of intelligent technology, and does not elaborate the resource dividend brought by intelligence, which makes the research on intelligent promotion of high-quality development of enterprises tend to lag behind.

Most of the existing research believes that the level of enterprise intelligence will promote the high-quality development of enterprises, but a few scholars have drawn different or even opposite conclusions. It can be found from the review that the producer paradox is not the result of the direct application of intelligence, but more research shows that the application of intelligent technology can significantly promote the high-quality development of manufacturing industry, vigorously promote and develop intelligent industry, and deepen the application and integration of intelligence in enterprises. Actively promote the construction of intelligent infrastructure, further improve the intelligent manufacturing public service platform, and create a good development environment by reducing the industry threshold and enterprise development costs to promote the high-quality development of enterprises. In the meantime, intelligent promotion of enterprise development is a complex systematic project. It cannot rely solely on the company 's own resources, and must introduce effective industrial policies. Through the rational layout of policies, we worked hard to accelerate the optimization and upgrading of the industrial structure, actively guide and support strategic emerging industries, and effectively help enterprises upgrade intelligently. We will enhance scientific and technological innovation capabilities, and establish and improve a scientific talent evaluation and incentive mechanism ; accelerate the development of producer services agglomeration, create agglomeration innovation demonstration areas, and cultivate new models of new formats.

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