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Research on the Influence of AI Technology and Optimization Strategy on the Chinese Manufacturing Enterprises about Digital Transformation

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Abstract: The rapid evolution of the digital economy has fostered a favorable environment for the growth of the artificial intelligence (AI) industry, catalyzing a transformative shift across diverse sectors. AI technology is driving the digital transformation landscape, contributing to the emergence of a novel economic framework characterized by enhanced unity, fairness, and operational efficiency. Particularly in China's manufacturing domain, substantial governmental support has propelled the widespread adoption of AI, thereby facilitating significant strides towards industrial modernization. However, despite the promising trajectory, notable challenges persist. These include the scarcity of AI talent, concerns regarding data security such as leakage, and the ongoing refinement of compatibility with existing systems. Addressing these challenges necessitates a multifaceted approach. Efforts should prioritize bolstering personnel training initiatives in AI-related domains through collaborative engagements with industry, universities, and research institutes. This cooperative endeavor can nurture a skilled workforce adept at navigating the complexities of AI implementation. Moreover, stringent measures must be implemented to safeguard sensitive data, including robust encryption protocols, secure computing practices, and meticulous access controls to mitigate the risks of data breaches. Furthermore, promoting standardization processes and embracing data format conversion tools are critical steps towards enhancing interoperability across disparate systems. In conclusion, this discourse underscores the pivotal role of AI in driving the digital transformation journey of Chinese manufacturing enterprises. By addressing pertinent challenges and embracing strategic initiatives, these enterprises can fortify their resilience, navigate future complexities, and achieve sustainable development in the digital era.

Keywords: Artificial Intelligence, Optimization Strategy, Digital Transformation, Chinese Manufacturing Enterprises

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1. Introduction

1.1. Research Background

Since the 1950s, artificial intelligence (AI) has been widely used in all walks of life, which has greatly changed society and brought endless business value. Digital transformation is the right approach for businesses. According to IDC's survey results, 67% of the Global 1000 companies believe this [1].

At present, the scale of industry has grown, but there are still plenty of problems [2]. According to the survey, AI usage among enterprises worldwide increased from 20% in 2017 to 50% in 2022, with Chinese enterprises at 41%, temporarily behind the global average. At the same time, the large-scale profit growth of Chinese enterprises has not been widely realized through AI technology. Compared to 19 percent of respondents in leading countries, only 9 percent of Chinese companies were able to achieve revenue growth of more than 10 percent with AI, and only 6% of companies employed translators in the past year, compared with 14% of companies in leading countries over the same period. This may affect enterprises' understanding and application of AI technology, thus weakening the benefits and business value brought by AI. In particular, enterprises do not pay enough internal talent training receives inadequate attention, with only about 30% of Chinese companies relying on in-house training to acquire AI talent, well below the global average of 45% [1].

This has become a bottleneck limiting China's leapfrog development. Digital transformation is critical to manufacturing, and artificial intelligence (AI) is seen as a new force capable of creating value from resources [3]. Through enterprise digitalization, production costs can be significantly reduced, the research and development strength of enterprises can be strengthened, innovation potential can be enhanced, and high-quality growth of the manufacturing industry can be promoted [4]. AI, as the core technology driving in decision-making, reshaping the business ecosystem, enhancing customer value, and improving employee work efficiency [3]. Actively promoting the transformation holds great significance for China's national economy.

1.2. Literature Review

The McKinsey Global survey reveals the current situation of AI development in China and proposes an AI strategy that is deeply integrated with enterprise business to accelerate talent transformation, improve talent training mechanisms, and fully release the economic value contained in artificial intelligence opportunities [1].

Li and Yang's research focuses on the importance of digital transformation for traditional manufacturing companies and uses Haier Group's "Internet factory" as an example to discuss ways to promote high-quality manufacturing. They advocate for China to actively encourage manufacturing enterprises to pursue digital innovation and adopt technology or technological innovation to ensure the survival and growth of businesses [5].

Using the TOE theoretical framework of industry digital transformation supported by artificial intelligence technology, Wang and Su conducted a number of case studies on three Chinese heavy industry manufacturing enterprises and summarized the key measures of adopting artificial intelligence technology to achieve intelligent production, including three aspects: technical factors, organizational status, and environmental drive [3].

1.3. Research Gap

For this aim, most articles mainly study the application of AI technology in improving production efficiency, optimizing production processes, and improving product quality. They focus on how to use AI technology to achieve technological innovation in intelligent manufacturing and automated

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production and the impact of these technological innovations on business performance and market competitiveness.

In contrast, in the study of AI's industry, few scholars have focused on the social impact and human-machine collaboration aspects of AI technology. These could include research into the role of AI technology in worker training and upskilling, as well as the effectiveness and sustainability of human-machine collaboration in smart manufacturing processes.

1.4. Research Framework

This article will first review the existing literature and summarize the application of AI technology in improving production efficiency, optimizing production processes, and improving product quality. Second, we will analyze the potential role of AI technology in worker training and upskilling and explore how AI technology can be used to promote the development of employees' expertise and skills to cope with the technological changes brought about by digital transformation. Thirdly, we will study the human-machine collaboration mechanism of AI in the intelligent manufacturing process and analyze how to achieve the effectiveness and sustainability of human-machine collaboration to improve the production efficiency and quality of the manufacturing industry. Through the research logic, we will provide novel theoretical and practical guidance for leveraging AI technology in driving the digital transformation of China's manufacturing sector.

2. Case Description

The Report shown that manufacturing industry of China is facing major transformation and upgrading challenges. Over the past few years, the demand for jobs related to digital transformation in manufacturing has continued to grow, and the number of companies Posting digital transformation-related jobs in 2023 has doubled compared to 2017 [6].

Despite the strides made in, it continues to grapple with numerous challenges [7].

The 2023 report shows that Chinese enterprises have made certain achievements in optimizing operations but have not yet formed obvious advantages in digital core construction and talent training and need to accelerate the pace.

The rapid development of artificial intelligence has made digital security and digital trust a common concern for businesses and society. In this context, the digital transformation of Chinese enterprises is facing higher requirements and broader challenges. Digital transformation has gradually evolved from a technical concept to an overall enterprise strategy and has received more and more attention. As the core of enterprise transformation, technology shows great potential; Talent and sustainable development provide new competitiveness for enterprises.

According to Accenture's 2023 survey, only 2% of Chinese companies have implemented a comprehensive digital rebranding strategy and become "remakers." The comprehensive digital reshaping marks that the enterprise digital transformation has entered a new stage, the competition rules have changed, and the enterprise transformation path is no longer a smooth and gradual curve. Therefore, enterprises should adjust their way of thinking as soon as possible to achieve a comprehensive digital reshaping so as to take the lead in future competition and become new leaders [8].

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3. Analysis on the Problem

3.1. Influence Identified of Chinese Manufacturing Enterprises

3.1.1. Impact of Using AI on Improving Production Efficiency and Reducing Costs

With the progress in the world, the role of artificial intelligence in driving industrial upgrading has become increasingly prominent. A study based on panel data analysis of 285 cities in China from 2000. It lasts for nine years, suggests that artificial intelligence fosters technological innovation and industrial upgrading, thereby contributing to industrial advancement and effectively curbing the deviation of industrial structure while promoting industrial rationalization [9].

Through the application of artificial intelligence technology, enterprises can optimize production processes, reduce costs, and minimize resource waste. The application of artificial intelligence technology not only solves visible problems, such as defect detection but also gradually turns to solving and avoiding invisible problems in production systems, such as process optimization, thereby improving the production efficiency of manufacturing systems and enhancing the competitiveness of products.

By accelerating the speed at which businesses learn from big data, AI drives product innovation and opens up new business opportunities [10]. At the same time, AI-driven predictive analytics can help with demand forecasting and inventory management, further improving operational efficiency and cost-effectiveness.

3.1.2. Impact of AI Integration on Supply Chain Optimization

Artificial intelligence technology has enabled intelligent and automated supply chain management. Concurrently, AI can conduct real-time monitoring of supply chain operations through data analysis and mining, by means of forecasting and optimization, artificial intelligence technology has enhanced the efficiency and effectiveness of the supply chain, creating more value for enterprises.

Anticipated is a closer integration of AI systems with the existing supply chain management systems, facilitating more precise data analysis or decision-making. This integration will enable organizations to anticipate and address disruptions in the supply chain, offer more secure or transparent supply chain management solutions, and better manage risk [11].

3.1.3. Transformative Effect of Using AI on Improving Product Quality and Innovation

The integration of AI has significantly improved product quality and innovation capabilities in the manufacturing process.

Based on data from the International Federation of Robotics regarding industrial robots and the analysis of 14 manufacturing sectors in China spanning from 2008 to 2017, artificial intelligence fosters technological innovation through accelerated knowledge creation and technology spillover, enhanced learning and absorption capacity, and augmented R&D and talent investment. This impact varies across industries, notably in low-tech sectors [12].

At the same time, AI quality control systems are able to detect defects more accurately and efficiently, ensuring that only high-quality products enter the market. AI-driven innovation tools, such as generative design and predictive maintenance, enable businesses to develop innovative products and services that maintain a competitive edge.

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3.2. Problem identified Analysis

3.2.1. Challenges of Workforce Transformation Brought About by AI Applications

There is a shortage of artificial intelligence talent, especially in role of AI translator. Translators play a key role in business problems and AI solutions. However, the survey shows that Chinese companies are more likely to hire for technical positions such as software engineers and data engineers while not paying enough attention to diverse talents such as translators and designers.

In addition, enterprises pay insufficient attention to internal talent training. AI talent usually comes from universities, other tech companies, and in-house training. However, the survey results show that Chinese enterprises show a preference for recruiting talent from prestigious universities and other technology companies, often overlooking the importance of internal talent development. Internal talents understand the company's business, processes, and organizational structure, and transforming them into AI translators is usually conducive to reducing communication costs and promoting the implementation of AI technology more effectively [1].

3.2.2. Data Security and Privacy Issues in AI Applications

AI systems exist vast amounts of the personal data, which if obtained by malicious actors, could be identity theft and cyberbullying. Despite the enactment of laws and measures by many governments to safeguard personal privacy, advancements in AI technology enable the re-identification of individuals and their association with demographic data through machine learning techniques, even when identity information has been removed [13].

Another significant challenge arises from the potential misuse of AI technology by malicious actors. AI has the capability to produce highly convincing counterfeit images and videos for the purpose of spreading misinformation. Additionally, AI can design to trick individuals into divulging sensitive information or interacting with malicious links [14].

3.2.3. Barriers to Compatibility of AI Applications with Existing Infrastructure

There are technical compatibility issues, such as mismatched interfaces between AI applications and existing systems or inconsistent data formats.

In terms of organizational management, the overall AI strategy is not mature enough, and there is a lack of strategies to guide AI design, implementation, and business coordination from the top. This has a significant impact on the effectiveness of AI and the company's overall earnings. The survey shows that compared with the global leading level, there is a big gap in the strategic coordination and effectiveness tracking of Chinese companies surveyed. Less than 30% of Chinese companies surveyed said they were able to align their AI strategy with their overall company strategy, and only 25% of executives fully agreed with the AI strategy [1]. In addition, compatibility barriers such as poor information sharing between departments within enterprises and imperfect management systems may also affect the effective implementation and operation of AI applications in China's manufacturing industry.

4. Suggestions

4.1. Labor Force Transformation Optimization Strategy: Strengthen Personnel Training and Industry-University-Research Cooperation

It is suggested that the relevant departments of the state promote the reform of education and training for enterprise digital transformation facilitate the further coordination among industry, academia, and research to enhance development. Emerging digital production factors such as artificial intelligence

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have become an important part of everyday commercial operations, driving industrial transformation and alterations in the employment landscape's supply and demand configuration. However, the transformative effects of intelligent technology on low-skilled, repetitive, and programmable tasks might be disregarded.

Therefore, we should pay attention to The discrepancy between labor market supply and demand and slow adjustment of labor skill structure. The state administrative departments should increase the investment in basic research, promote the investment in the experimental development of enterprises, and clarify the urgent demand for talent in the era of the digital economy. Under the guidance of deepening the reform of the education system, various types of colleges or universities are encouraged to join artificial intelligence, big data analysis, and other related majors and establish an employment training system.

Manufacturing enterprises that are about to undergo digital transformation should strengthen their training in innovative, technical or professional technical talents. Focus on the cultivating talents in interdisciplinary or AI-related majors, enhance workers' ability to adapt to emerging sectors and novel technologies, and cultivate skills needed for complex jobs that will be difficult to replace with artificial intelligence in the future. Encourage employees to engage in AI skills training and related knowledge acquisition through talent exchange and other means [15].

4.2. Optimization Strategy for Data Privacy and Security: Encryption Computing and Desensitization Control

The rapid development of AI technology also presents significant challenges related to data privacy and security.

Data encryption: Encrypts data to ensure data security during transmission and storage; companies need to adopt practical and effective cybersecurity mechanisms, such as encryption protocols, and conduct regular employee training to raise awareness of possible online threats.

Secure computing: Secure computing technology can maintain the encrypted state of the data during the calculation process; even if an attack or leak occurs on the computing party or the network, it will not disclose the plaintext information of the data. In addition, companies need to establish monitoring mechanisms to regularly assess compliance with established safety standards and identify potential room for improvement.

Data desensitization: The desensitization of sensitive data, such as the use of blurring techniques or data slicing, to prevent data from being restored to its original form, thereby protecting data privacy. For example, sensitive data is encrypted before it is fed into AI algorithms, and advanced authentication methods such as biometric tools are employed.

Access control: Restrict who can access data by setting access permissions to ensure that only authorized people can manipulate sensitive data. In addition, companies should have strict policies that define the access rights and authorities of stakeholders related to confidential information to protect personal information from the threat of unauthorized access or manipulation [16].

4.3. Optimization Strategies for the Compatibility of AI with Existing Facilities: Technology and Labor

Promote standardization: Develop industry standards and common interfaces to ensure that AI applications are compatible with existing systems. This can be promoted and developed through industry organizations or standardization bodies.

Data format conversion tools: Develop data format conversion tools to solve the compatibility problem between different data formats so that data can be effectively converted and exchanged.

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Develop a comprehensive AI strategy: Companies should develop a comprehensive AI strategy from the top and integrate it into their overall strategy. This requires the active involvement and support of senior management to ensure that the design, implementation, and business coordination of AI are aligned with the overall company strategy.

Improve the information sharing and management system: strengthen the information sharing among various departments within the enterprise, establish the more perfect management system, and ensure flow and communication's information. Measures such as improved communication channels, clear procedures, and demarcation of responsibilities may be needed.

5. Conclusion

This paper mainly discusses the influence of the artificial intelligence on the digital transformation optimization strategy in China's manufacturing industry. Artificial intelligence can promote industrial upgrading and create new ecological organization models; Intelligent automation of the supply chain can be realized. It can also improve product quality and innovation capacity. However, some of the accompanying problems are also worth thinking about, such as the lack of artificial intelligence talent reserve, the large amount of data required may be abused or misused, and the compatibility with existing equipment personnel needs to be improved. Fortunately, according to the research in this paper, it is possible to strengthen personnel training, cooperate with industry, universities, and research institutes, and also carry out data encryption, secure computing, data desensitization, access control, and other methods to solve the problems caused by artificial intelligence. In addition, the company should promote the construction of standardization, add data format conversion tools, and develop a sound artificial intelligence strategy and management system. All of the above can effectively solve a series of problems caused by the digital transformation of artificial intelligence industry so that enterprises are more vibrant and dynamic.

The application of artificial intelligence has become more and more extensive. As a key new technological capability, along with the continuous expansion of industrial application scale, artificial intelligence has begun to realize its high-quality digital transformation and development for all walks of life. It is also seen as the core catalyst for advancing the digital economy nationwide.

This paper lacks primary data and mainly uses secondary data. Due to technical and material limitations, other impacts of AI, such as cost pressures and risk management, are not examined in this paper. In the future, primary data can be obtained through surveys, interviews, and other means to explore the above issues further.

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