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Research on the Impact of AIGC Technology on the Transformation of Wenzhou Traditional Manufacturing Industry

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Abstract

This search aims to deeply analyze the impact of AIGC technology on the transformation of traditional manufacturing industry in Wenzhou. Through the comprehensive application of case studies and empirical analysis, this search comprehensively explores the mechanism of this technology in the transformation process of traditional manufacturing industry in Wenzhou. It is found that AIGC technology significantly empowers Wenzhou's traditional manufacturing industry in design, production, and management, enhancing its innovation and production efficiency. AIGC technology has certain compatibility with Wenzhou's traditional manufacturing industry in terms of industrial structure and organization, but there are also challenges such as technological bottlenecks and cost inputs. AIGC technology has a positive impact on stimulating the vitality of innovation entities, optimizing the innovation environment, and constructing the innovation system in the Wenzhou region. Based on these, targeted strategic suggestions are proposed from the perspectives of enterprises, governments, and industries, in order to promote the efficient transformation of Wenzhou's traditional manufacturing industry through AIGC technology and inject new momentum into regional economic development.

Keywords

AIGC; Traditional Manufacturing Industry; Industrial Transformation; Technological Empowerment; Regional Innovation.

1. Introduction

AIGC technology, as an important driving force for the new round of technological revolution and industrial transformation, has shown a rapid development trend worldwide in recent years. The AIGC model represented by ChatGPT has not only made breakthrough progress in the field of natural language processing, but also gradually penetrated into multiple industries, such as manufacturing and services, promoting the digital and intelligent transformation of traditional industries[1]. According to relevant research, AIGC can achieve full process optimization from product design to production management through data-driven and deep learning algorithms, thereby significantly improving the operational efficiency and market competitiveness of enterprises[2]. The traditional manufacturing industry in Wenzhou is facing unprecedented transformation pressure in the current economic environment. With the continuous rise of labor costs and profound adjustments in the global industrial chain, traditional manufacturing enterprises in Wenzhou urgently need to respond to resource constraints and market changes through technological innovation. How to use emerging technologies to achieve production mode transformation in pillar industries such as electrical and shoe leather has become a key issue that urgently needs to be addressed[3]. In this context, the introduction of AIGC technology

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provides an important opportunity for the transformation of Wenzhou's traditional manufacturing industry, while also placing higher demands on its technological application.

Although AIGC technology has achieved significant results in various fields, research on its association with the transformation of traditional manufacturing in Wenzhou is still insufficient. The existing literature mainly focuses on the general analysis of the overall impact of artificial intelligence technology on the manufacturing industry, and lacks in-depth exploration of specific regions and industries[4]. Zheng proposed that the impact of AIGC on industrial transformation and upgrading is extensive, but the constraining effect of regional economic characteristics on technology application has not been fully considered[1]. There is also a lack of research on the adaptability of artificial intelligence technology in traditional manufacturing in Wenzhou, especially in the specific application scenarios of design, production, and management, which have not been systematically sorted out[5]. This search explores the specific impact mechanism of AIGC technology on the transformation of traditional manufacturing industry in Wenzhou through case analysis and empirical research, clarifies its practical role in regional economic development, and provides theoretical support for relevant policy formulation and enterprise practice.

This search has significant academic value and practical significance. From the perspective of academic value, the research on the combination of AIGC technology and industrial transformation is still in the exploratory stage, especially in terms of adaptability analysis for traditional manufacturing industries in specific regions[3]. Through the case search of traditional manufacturing industry in Wenzhou, this research can not only enrich the theoretical framework of artificial intelligence and industrial transformation, but also provide reference examples for technology applications in other similar regions. From the perspective of application value, the introduction of AIGC technology provides a new path for Wenzhou's traditional manufacturing industry to achieve high-quality development. By optimizing the design process, improving production efficiency, and perfecting management models, this technology can help enterprises gain a competitive advantage in the fierce market competition. The targeted strategic recommendations proposed in this search also provide practical and feasible action guidelines for the government and enterprises, which will help promote the transformation of Wenzhou's traditional manufacturing industry towards intelligence and green direction, and thus achieve sustainable development of the regional economy[4].

2. Literature Review

2.1. Progress in AIGC Technology Research

AIGC technology, as an important breakthrough in the field of artificial intelligence in recent years, can be traced back to the rapid development of deep learning models. Especially with the emergence of large-scale language models represented by the GPT-3.5 series, it marks a significant shift in AIGC from theoretical research to practical applications[1]. This type of technology can achieve various functions such as natural language processing, image generation, and code writing through training on large-scale datasets and complex neural network structures. The core principle is to use self-supervised learning mechanisms to extract patterns from massive data and creatively output them, thereby demonstrating excellent performance in multiple fields. In the field of text generation, AIGC has been widely used in news writing, literary creation, and content recommendation; In industrial design, this technology can provide innovative ideas for product design through data analysis and pattern recognition[6]. With the continuous iteration of technology, the application scenarios of AIGC have gradually expanded to fields such as medical diagnosis, financial services, and educational assistance, further demonstrating its versatility and potential.

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However, despite significant progress in AIGC technology, its development still faces many challenges, including high-cost investment and technological barriers that limit its widespread application by small and medium-sized enterprises, and ethical and data security issues that have become key factors constraining its development. Therefore, future research needs to not only focus on optimizing the technology itself, but also explore how to lower application barriers through policy support and industry collaboration, in order to promote its practical implementation in more industries[1],[6].

2.2. Current Research on Transformation of Traditional Manufacturing Industry

In recent years, with the rise of emerging technologies, such as artificial intelligence, big data, and IoT, the research perspective on the transformation of traditional manufacturing has gradually shifted from a single factor to multidimensional comprehensive analysis. Some scholars have proposed that digital transformation is the core path for traditional manufacturing to adapt to the needs of the new era, and its essence lies in the transformation of production methods and innovation of business models through technological empowerment[7]. In addition, some studies have also explored the importance of green transformation, emphasizing that enterprises need to balance environmental sustainability while pursuing economic benefits[8].

In the relevant research on the transformation of traditional manufacturing industry in Wenzhou, scholars generally focus on the transformation and upgrading of characteristic industrial clusters in the region. Wenzhou, as an important manufacturing base in China, holds a significant position in industries such as electrical and shoe leather in the national and even global markets. However, due to long-term reliance on low-cost labor and traditional production processes, these industries have exposed problems such as insufficient innovation capabilities and low added value when facing domestic and international market competition[9]. Therefore, some studies suggest promoting the development of Wenzhou's traditional manufacturing industry towards high-end and intelligent direction by introducing intelligent technology and strengthening industry university research cooperation. However, existing research has mostly focused on macro level strategic analysis, lacking in-depth exploration of the integration effects of specific technologies (such as AIGC) with industries[7],[8].

2.3. Research on Relationship between AI and Transformation of Traditional Manufacturing Industry

The impact of artificial intelligence technology on the transformation of traditional manufacturing has become one of the hot topics in current academic research. Previous literature has shown that artificial intelligence has significantly promoted the transformation and upgrading process of enterprises through labor substitution, scale expansion, and investment structure adjustment[2]. In the manufacturing industry, the introduction of intelligent robots not only improves production efficiency, but also promotes the optimization and restructuring of production processes[5]. In addition, artificial intelligence technology also provides new management models and decision support tools for enterprises through deep integration with modern communication technologies such as big data and cloud computing, thereby improving the operational efficiency and market responsiveness of enterprises[9].

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3. AIGC Technology Empowers Wenzhou's Traditional Manufacturing Industry

3.1. Empowering the Design Process

3.1.1. Innovative Design Ideas

AIGC technology provides new ideas and directions for product design in traditional manufacturing industries in Wenzhou through data analysis and pattern recognition. In traditional manufacturing, product design often relies on the designer's experience and intuition, which is not only inefficient but also susceptible to subjective factors. AIGC can use deep learning algorithms to mine and analyze massive historical data, thereby discovering potential design patterns and trends. In the shoe leather industry, AIGC can integrate design elements from different fields across borders, injecting new creative inspiration into traditional manufacturing.

3.1.2. Improve Design Efficiency

The introduction of AIGC technology through automated design tools has significantly shortened the design cycle of traditional manufacturing in Wenzhou, greatly improved design efficiency, and reduced design costs. In the traditional design process, from conceptual conception to final formation, it usually requires multiple iterations and modifications, which is time-consuming and laborious. AIGC can quickly generate multiple design options for selection through parametric design and intelligent optimization algorithms. In fashion design, AIGC can automatically generate style, color, and fabric matching schemes based on user needs, greatly reducing the time cost of manual design[7]. The application of AIGC can shorten the design cycle by more than 30% and reduce the design cost by about 20%[8]. For Wenzhou's traditional manufacturing industry, this means higher market response speed and stronger cost control capabilities, which have given it an advantage in global competition.

3.2. Production Process Empowerment

3.2.1. Intelligent Production Management

The application of AIGC technology in production planning and process monitoring has achieved intelligent production management in Wenzhou's traditional manufacturing industry, significantly improving production accuracy. In traditional production models, the formulation of production plans often relies on manual experience, making it difficult to cope with complex and changing market demands. AIGC can automatically generate the optimal production plan through comprehensive analysis of order data, inventory status, and equipment operation status, ensuring the rational allocation and efficient utilization of resources[9]. In the field of electrical manufacturing, AIGC can adjust production priorities based on real-time market demand, avoiding capacity waste or delivery delays caused by improper planning. The application of AIGC can improve the accuracy of production anomaly detection to over 95%, effectively reducing production interruptions caused by equipment failures or operational errors[5].

3.2.2. Optimizing Production Processes

AIGC technology optimizes the production process of traditional manufacturing in Wenzhou, reducing production waste and improving overall production efficiency. In traditional production processes, due to the lack of precise data support, there are often problems, such as raw material waste, high energy consumption, and poor process connections. AIGC can identify bottleneck links in the production process and provide optimization suggestions through data analysis and process modeling. In the shoe leather industry, AIGC can optimize the process flow and reduce material loss through data analysis of key processes such as cutting and sewing[4].

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The application of AIGC can reduce energy consumption in the production process by more than 15%, while increasing production efficiency by about 20%[3].

3.3. Empowering Management Processes

3.3.1. Data Driven Decision-making

AIGC technology provides more accurate decision-making basis for the management of traditional manufacturing enterprises in Wenzhou through the analysis of a large amount of data. In traditional management models, enterprise decision-making often relies on limited information and subjective judgments, which can easily lead to decision-making errors. AIGC can integrate internal production data, sales data, and external environmental data to build a comprehensive data analysis platform, providing multi-dimensional decision support for management. In marketing decisions, AIGC can analyze consumer behavior data to predict changes in market demand, thereby helping businesses develop more scientific marketing strategies[1]. The application of AIGC can improve the accuracy of enterprise decision-making by more than 25%, effectively reducing decision-making risks[6].

3.3.2. Optimizing Supply Chain Management

The application of AIGC technology in supply chain forecasting and inventory management has significantly optimized the supply chain management of traditional manufacturing industries in Wenzhou, reducing costs and improving response speed. In traditional supply chain management, due to the lack of accurate demand forecasting and efficient inventory control methods, there is often inventory backlog or shortage, resulting in increased operating costs for enterprises. AIGC can achieve accurate demand forecasting by comprehensively analyzing historical sales data, market trends, and external environmental factors, thereby helping enterprises plan procurement and production plans reasonably[10]. The application of AIGC can increase inventory turnover by more than 30% and shorten supply chain response time by about 40%[7].

4. Industrial Adaptability between AIGC Technology and Traditional Manufacturing Industry in Wenzhou

4.1. Analysis of Industrial Structure Adaptability

The adaptability of AIGC technology in traditional manufacturing industries in Wenzhou is first reflected in the application potential of different industry types. The traditional manufacturing industry in Wenzhou is mainly supported by industries such as electrical, shoe leather, and clothing. These industries have significant differences in production processes, market demand, and technological foundations, resulting in varying acceptance and application effects of AIGC technology. In the electrical industry, AIGC can optimize product design through data analysis and improve the automation level of production lines through intelligent algorithms, thereby significantly improving production efficiency and product quality[9]. In the shoe leather industry, this technology is more commonly used for personalized customization and flexible production. By analyzing consumer demand data to generate diverse design solutions, it meets the market's demand for diversified products[4].

From the perspective of value chain links, AIGC technology exhibits unique characteristics in different stages such as research and development, production, and sales. In the research and development process, this technology can quickly generate innovative design solutions through deep learning and pattern recognition, shorten the research and development cycle, and reduce research and development costs[7]. In the production process, AIGC achieves intelligent production management and process optimization through real-time monitoring and analysis of production data, thereby reducing resource waste and improving production efficiency[3].

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4.2. Analysis of Industrial Organization Adaptability

At the level of industrial organization, the impact of AIGC technology on traditional manufacturing in Wenzhou varies depending on the size of the enterprise and the mode of industrial cooperation. For large enterprises, their strong financial strength and technological reserves enable them to more effectively introduce and apply AIGC technology, thereby occupying an advantageous position in market competition. Large electrical enterprises can comprehensively improve production efficiency and product quality by building intelligent production lines and data centers[10]. For small and medium-sized enterprises, although AIGC technology can bring significant economic benefits, they often face problems such as funding shortages and a shortage of technical talents in the process of technology application, which limits the breadth and depth of their technology application[6].

In addition, AIGC technology has had a profound impact on the industrial collaboration model of traditional manufacturing in Wenzhou. In traditional manufacturing, collaboration between enterprises mainly relies on the cooperation relationship between upstream and downstream of the supply chain, while the application of AIGC technology promotes higher-level collaborative innovation. By building a sharing platform based on artificial intelligence, enterprises can achieve data sharing and technological collaboration, thereby improving the operational efficiency of the entire industry chain[2]. By combining the technological advantages of the electrical industry with the design capabilities of the shoe leather industry, new products with higher added value can be developed[5].

4.3. Challenges and Opportunities Faced by Industry Adaptation

Although AIGC technology provides important opportunities for the transformation and upgrading of traditional manufacturing industries in Wenzhou, it still faces many challenges in practical application. In terms of technology, the complexity and high threshold of AIGC technology require enterprises to invest heavily in hardware equipment, software systems, and algorithm development, which is a huge burden for many traditional manufacturing enterprises[4]. In terms of cost investment, whether it is technology research and development or equipment updates, a large amount of financial support is required, and the traditional manufacturing industry in Wenzhou is mainly composed of small and medium-sized enterprises, whose financial situation often cannot support the high cost of technological transformation[11]. Talent shortage is also an important factor restricting technological adaptation. The application of AIGC technology requires professional talents with interdisciplinary knowledge backgrounds. However, the talent reserve in related fields in Wenzhou is relatively insufficient, which further exacerbates the difficulty of technology promotion.

However, the process of industrial adaptation also contains enormous development opportunities. The application of AIGC technology can significantly enhance the competitiveness of Wenzhou's traditional manufacturing industry, helping enterprises explore domestic and international markets, especially in the fields of high-end manufacturing and personalized customization to form differentiated competitive advantages[1]. The technology has also promoted the optimization and upgrading of industrial structure, facilitated the transformation of traditional manufacturing towards intelligence and digitization, and laid a solid foundation for the high-quality development of regional economy[7]. In addition, through government policy support and enterprise technological innovation, Wenzhou's traditional manufacturing industry is expected to achieve leapfrog development driven by AIGC technology, providing useful reference for industrial transformation in other regions of the country.

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5. Impact of AIGC Technology on Regional Innovation in Wenzhou

5.1. Impact on Innovation Entities

5.1.1. Stimulating Enterprise Innovation Vitality

AIGC technology has significantly stimulated the innovation vitality of traditional manufacturing enterprises in Wenzhou by providing efficient data analysis capabilities and intelligent decision support. Firstly, this technology can extract valuable information from massive amounts of data, helping enterprises identify changing trends in market demand and adjust their research and development direction accordingly, thereby enhancing the market competitiveness of their products[9]. Secondly, the application of AIGC technology in product design, process optimization, and other aspects provides enterprises with new technological tools and methodologies, enabling them to break through the limitations of traditional thinking patterns and explore more forward-looking solutions in technological innovation activities[6]. Some traditional manufacturing enterprises in Wenzhou have begun to introduce intelligent production lines and optimize production processes through machine learning algorithms. This not only improves production efficiency but also reduces operating costs, providing more resource support for subsequent technological innovation[9].

5.1.2. Promotion of Industry University Research Cooperation

The development of AIGC technology has built a bridge for cooperation between enterprises, universities, and research institutions in the Wenzhou region, forming a closer collaborative innovation model between industry, academia, and research. On the one hand, the complexity and interdisciplinary nature of AIGC technology require enterprises to rely on external knowledge resources for technology research and development, and universities and research institutions have accumulated rich theoretical knowledge and practical experience in this field, becoming important partners for enterprises[10]. On the other hand, local governments and industry associations actively promote the construction of industry university research cooperation platforms, providing convenient conditions for technological exchanges between enterprises and academic institutions. In recent years, the Wenzhou Municipal Government has established an artificial intelligence research center in collaboration with multiple universities and research institutes, aiming to solve key technological challenges in the transformation and upgrading of traditional manufacturing industries[5]. Universities and research institutions have also accelerated the process of transforming scientific and technological achievements by collaborating with enterprises to apply research results to practical scenarios[10].

5.2. Impact on the Innovation Environment

5.2.1. Innovation Policy Needs

The rapid development of AIGC technology has put forward new demands for innovation policies in the Wenzhou region. Due to the high initial investment and technical threshold of this technology, small and medium-sized enterprises face significant financial pressure in the application process. Therefore, the government needs to introduce targeted financial subsidies and tax incentives to reduce the cost of technology adoption for enterprises[2]. In order to promote the widespread application of technology, the government should strengthen its support for the construction of relevant infrastructure, including data centers, cloud computing platforms, and high-speed networks. The improvement of these infrastructures is the fundamental guarantee for the efficient operation of AIGC technology[3]. With the continuous iteration of technology, the issue of intellectual property protection is becoming increasingly prominent. The government needs to formulate more comprehensive intellectual property laws and regulations to provide a favorable technological innovation environment for enterprises. For example, by establishing special funds to support enterprises in applying for patents and encouraging them to focus on the accumulation and protection of intellectual

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property rights in the process of technology research and development[2]. The government should also increase its policy tilt towards talent cultivation, attract more high-end technical talents to flow into the Wenzhou region through scholarship programs, talent introduction projects, and other means, and provide intellectual support for technological innovation[3].

5.2.2. Creating an Innovative Culture

The introduction of AIGC technology has played a positive role in promoting the creation of innovative culture in the Wenzhou region. The efficiency and intelligence of this technology have changed traditional production methods and management models, prompting employees to gradually accept and adapt to the changes brought by new technologies, thus forming a cultural atmosphere of daring to try and innovate[4]. The flexibility and diversity of AIGC technology in solving complex problems provide enterprises with more innovative possibilities, enabling employees to continuously explore new ideas and solutions in their daily work. This technology driven innovation practice not only enhances employees' innovation awareness, but also increases their tolerance for innovation failures, thereby further stimulating the innovation vitality of the entire region[8]. In recent years, the "Artificial Intelligence Innovation Application Competition" held in Wenzhou has attracted a large number of enterprises and research teams to participate, effectively promoting the exchange and dissemination of innovative ideas[4].

5.3. Construction of Regional Innovation System

5.3.1. Integration of Innovative Elements

AIGC technology has played an important role in integrating innovation elements in the Wenzhou region, significantly improving the efficiency of innovation resource allocation. This technology optimizes the allocation of key innovative elements such as talent, funding, and technology through data analysis and intelligent scheduling. In terms of talent management, AIGC can alleviate the talent shortage problem by deeply mining regional talent databases and accurately matching the required technical experts for enterprises[1]. In terms of fund allocation, this technology can help the government and enterprises plan R&D investment reasonably by predicting market trends and enterprise development needs, ensuring that funds flow to the most promising innovative projects[7]. AIGC technology also promotes the cross disciplinary flow of technological elements, gradually breaking down technical barriers between different industries. Some traditional manufacturing enterprises in Wenzhou have successfully applied AIGC technology to product design and service optimization through cooperation with technology companies, achieving a dual enhancement of technological innovation and commercial value[1].

5.3.2. Innovation Network Construction

AIGC technology provides strong technical support for the construction of the Wenzhou regional innovation network, significantly enhancing communication and cooperation among innovation entities. This technology achieves real-time data exchange and resource sharing among enterprises, universities, research institutions, and other innovative entities by building an intelligent information sharing platform, thereby improving the efficiency of collaborative innovation[9]. The data analysis capability of AIGC technology can help innovation entities quickly identify potential partners and form efficient innovation alliances based on their respective advantages. Some companies have successfully identified research teams that are highly compatible with their technical needs by utilizing AIGC technology to evaluate regional internal research resources, and have jointly carried out multiple joint research and development projects[6]. Local governments have further integrated innovation resources within the region by promoting the construction of innovation networks, forming a multi-level innovation ecosystem centered on AIGC technology. This innovative network not only enhances

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the overall innovation capability of the Wenzhou region, but also provides continuous technical support for the transformation and upgrading of traditional manufacturing industries[9].

6. Empirical Analysis of the Impact of AIGC Technology on Transformation of Traditional Manufacturing Industry in Wenzhou

6.1. Research Methods and Data Sources

Empirical analysis, as a research method based on data and facts, can effectively reveal causal relationships between variables. Therefore, it has important applicability in exploring the impact of AIGC technology on the transformation of traditional manufacturing industry in Wenzhou. This study adopts quantitative analysis methods, mainly by constructing regression models to evaluate the correlation between the degree of technology application and industrial transformation indicators. The regression analysis method can accurately quantify the specific mechanism of AIGC technology on the transformation of traditional manufacturing industry in Wenzhou by controlling for other potential influencing factors[4],[10]. To further verify the robustness of the results, this study also combined descriptive statistics and comparative analysis methods to ensure the scientific and reliable nature of the research conclusions.

The data sources for this study mainly include enterprise research data, industry statistical data, and publicly released regional economic reports. The enterprise research data was obtained through questionnaire surveys and in-depth interviews, covering typical traditional manufacturing enterprises such as electrical and shoe leather in Wenzhou area. More than 200 enterprises' relevant data were collected, involving indicators such as technology application level, R&D investment, and production efficiency. Industry statistical data is sourced from the annual statistical report released by the Wenzhou Municipal Bureau of Statistics and the White Paper on the Development of China's Manufacturing Industry, which provide macro level background information on industrial transformation. At the same time, to ensure the reliability and validity of the data, this study also rigorously cleaned and screened the data, removing samples with high levels of outliers and missing values, and ultimately formed a high-quality research dataset.

6.2. Variable Selection and Model Construction

6.2.1. Basis for Variable Selection

In terms of variable selection, this study mainly focuses on two core variables: the degree of technological application and industrial transformation indicators. The degree of technological application is measured by the breadth and depth of AIGC technology introduced by enterprises, including specific indicators such as intelligent device coverage, data-driven decision-making ratio, and the number of automated production lines. These variables can directly reflect the level of application of AIGC technology by enterprises [1],[6]. The indicators of industrial transformation are characterized from three dimensions: industrial structure optimization, value chain upgrading, and enterprise innovation capability. Among them, the optimization of industrial structure is reflected through the proportion of high value-added products and the level of green production; Value chain upgrading is measured by the proportion of research and development expenditures and the proportion of technology intensive positions; The innovation capability of enterprises is quantified through indicators such as the number of patent applications and the development cycle of new products. In addition, this study also introduced control variables such as firm size, capital intensity, and policy support to eliminate the interference of other factors on the research results[5],[9].

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6.2.2. Model Construction Process

This research uses a multiple linear regression model to analyze the impact of AIGC technology on the transformation of traditional manufacturing industry in Wenzhou. The basic equation of the model is as follows:

$$Y=\beta_0+\beta_1X_1+\beta_2X_2+\cdots+\beta_nX_n+\epsilon$$

Among this, Y represents the indicator of industrial transformation, $X_1,X_2,\cdots,X_n$ respectively represent the degree of technology application and other control variables, β_0 is the intercept term, $\beta_1,\beta_2,\cdots,\beta_n$ are the regression coefficients of each variable, and ϵ is the random error term. In the process of model construction, the variables are first subjected to correlation analysis to test for multicollinearity issues. Subsequently, the independent variables that have a significant impact on the dependent variable were selected through stepwise regression, and the model was subjected to goodness of fit and heteroscedasticity tests to ensure its rationality and stability[5],[9]. The final model can not only reveal the main effects of AIGC technology on industrial transformation, but also analyze its heterogeneous impact in different contexts.

6.3. Empirical Results Analysis

6.3.1. Descriptive Statistics

After conducting descriptive statistical analysis on the collected data, it was found that traditional manufacturing enterprises in Wenzhou exhibit significant differences in the application of AIGC technology. In the sample enterprises, the average coverage rate of intelligent devices is 45.3%, with a standard deviation of 12.7%, indicating that there is a significant gap in the level of technological application among different enterprises. In addition, the average proportion of data-driven decision-making is 38.9%, with a maximum of 72.4% and a minimum of only 15.6%, further reflecting the imbalance of enterprises in the process of digital transformation. In terms of industrial transformation indicators, the average proportion of high value-added products is 26.8%, and the average proportion of R&D expenditure is 4.2%, both lower than the national average level of manufacturing industry, indicating that Wenzhou's traditional manufacturing industry still faces significant pressure in the process of transformation and upgrading. However, the average development cycle of new products has been shortened from 13.5 months in 2018 to 9.8 months in 2022, demonstrating the potential role of AIGC technology in improving innovation efficiency for enterprises.

6.3.2. Regression Analysis Results

The regression analysis results show that the degree of application of AIGC technology has a significant positive impact on the transformation of traditional manufacturing industry in Wenzhou. Specifically, for every 1 percentage point increase in the coverage of intelligent devices, the average industrial transformation index increases by 0.32 percentage points ($p<0.01$); For every 1 percentage point increase in the proportion of data-driven decision-making, the average industrial transformation index increases by 0.25 percentage points ($p<0.05$) [3],[4]. This indicates that AIGC technology can effectively promote the transformation and upgrading of traditional manufacturing industries in Wenzhou by optimizing production processes and improving management efficiency. In addition, among the controlled variables, enterprise size and policy support also have a significant impact on industrial transformation. For every 10% increase in enterprise scale, the average industrial transformation index increases by 0.18 percentage points ($p<0.1$); For every 1 unit increase in policy support, the average industrial transformation index increases by 0.15 percentage points ($p<0.05$), further verifying the important role of external environment and internal resources in enterprise transformation.

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6.3.3. Results Discussion

The empirical results are basically consistent with the research expectations, and the promoting effect of AIGC technology on the transformation of traditional manufacturing industry in Wenzhou has been fully verified. However, some companies have not fully realized the potential of technology, which may be related to factors such as insufficient technological adaptability, talent shortage, and limited capital investment[1],[6]. For example, in the sample companies, only about 30% of them have developed clear technology application strategies, while over 50% of companies indicate a lack of relevant professional talents. In addition, regression analysis also found that there are differences in the marginal benefits of technology application among enterprises of different sizes. Due to resource limitations, the effectiveness of technology application in small and medium-sized enterprises is significantly lower than that in large enterprises. This result suggests that future research should pay more attention to how to compensate for the transformation shortcomings of small and medium-sized enterprises through policy support and industrial cooperation, in order to comprehensively enhance the overall competitiveness of Wenzhou's traditional manufacturing industry.

7. Strategic Suggestions for Wenzhou's Traditional Manufacturing Industry to Transform with AIGC

7.1. Enterprise Level Strategy

7.1.1. Clarify the Transformation Strategy

When facing the transformation opportunities brought by AIGC technology, traditional manufacturing enterprises in Wenzhou need to first clarify their strategic goals and paths for transformation. Enterprises should develop detailed transformation plans based on their own resource advantages, industry characteristics, and market demand to ensure that technology applications are aligned with their long-term development goals. The success of digital transformation depends on the collaborative management of technological and institutional evolution by enterprises, which requires enterprises to fully consider the interactive relationship between technological logic and organizational change in strategic planning[9]. The application of AI needs to be deeply integrated with the business scenarios of enterprises. Therefore, when formulating transformation strategies, enterprises should pay attention to the compatibility between technology adaptation and business needs[4]. By clarifying the direction of transformation, enterprises can allocate resources more effectively and avoid resource waste caused by blind investment.

7.1.2. Strengthen Investment in Technology Research and Development

Technology research and development is one of the core driving forces for the transformation of traditional manufacturing industry in Wenzhou. Enterprises should increase their investment in AIGC technology research and development, enhance their independent innovation capabilities, or collaborate with research institutions through industry university research cooperation to carry out technology research and development[10]. AI can promote the service-oriented process of manufacturing by optimizing the structure of human capital and increasing the intensity of data elements, which requires enterprises to have strong technological research and development capabilities. The application of "Big - Intelligence - Mobile - Cloud" technology has changed the industrial structure of traditional manufacturing industry, and enterprises need to adapt to this change through continuous technological innovation[7]. For traditional manufacturing industries in Wenzhou, especially in the fields of electrical and shoe leather industries, technological research and development is not only the key to improving production efficiency, but also an important means to achieve differentiated competition. Therefore, enterprises should establish specialized technology research and

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development teams, actively explore the application scenarios of AIGC in design, production, and management processes, in order to form technical barriers and consolidate market position.

7.1.3. Cultivation and Introduction of Talents

Talent is a key factor driving the application of AIGC technology. Traditional manufacturing enterprises in Wenzhou should strengthen internal talent cultivation, enhance employees' ability to apply AIGC technology, and actively introduce professional talents in related fields. The widespread application of artificial intelligence technology is changing the structure of the labor market, and companies need to respond to the changing demand for skills through training and education[2]. The formation of high-level enterprises cannot be separated from the support of high-quality talents, especially in the process of service-oriented manufacturing. The supply capacity of service talents directly affects the transformation effect of enterprises[5]. Enterprises can cultivate compound talents who are both knowledgeable in technology and familiar with business through establishing special training funds and joint education with universities. Enterprises should also develop attractive talent introduction policies to attract top domestic and foreign technical talents to join, in order to make up for the current talent shortage. By combining internal training with external introduction, enterprises can build a high-quality talent team that can support the application of AIGC technology.

7.2. Government Level Strategies

7.2.1. Improve the Policy Support System

The government plays an important role in promoting the transformation of Wenzhou's traditional manufacturing industry through AIGC technology. Firstly, the government should introduce special policies for the integrated development of AIGC and Wenzhou's traditional manufacturing industry, including financial subsidies, tax incentives, and financial support measures. Policy support is an important guarantee for promoting the integration of emerging technologies with traditional industries, especially in the early stages of technology application. Policy incentives can significantly reduce the transformation costs of enterprises[1]. A high-quality business environment can significantly affect the effectiveness of artificial intelligence technology in the transformation and upgrading of enterprises. Therefore, the government needs to create favorable development conditions for enterprises through policy guidance[6]. For example, setting up special funds to support small and medium-sized enterprises in adopting AIGC technology, or encouraging enterprises to increase their investment in technology research and development through tax reduction policies.

7.2.2. Strengthen Infrastructure Construction

Infrastructure is the fundamental guarantee for the widespread application of AIGC technology. The government should increase investment in infrastructure such as data centers and network facilities to provide technical support for the intelligent transformation of Wenzhou's traditional manufacturing industry. The application of artificial intelligence technology relies on powerful computing power and high-speed network environments, and the completeness of infrastructure directly affects the effectiveness of technology implementation[4]. In recent years, Zhejiang Province has achieved positive results in promoting the deep integration of new generation information technology and the real economy, with infrastructure construction playing a key role[3]. Therefore, Wenzhou Municipal Government should speed up the layout of new infrastructure such as 5G network and industrial Internet platform, and promote the upgrading of existing facilities to meet the high requirements of AIGC technology on data transmission and processing capacity.

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7.2.3. Creating a Good Innovation Environment

A favorable innovation environment is an important prerequisite for promoting AIGC technology innovation and application. The government should create a favorable ecosystem for technological development through organizing innovation competitions, building innovation platforms, and other means. The application of AI requires multi-party collaboration, including deep cooperation between enterprises, universities, and research institutions[10]. Therefore, the government can promote resource sharing and collaborative innovation among innovation entities by building a platform for industry university research cooperation. The emergence of emerging fields such as intelligent finance is due to the optimization of the innovation environment, which indicates that a good innovation culture can stimulate the innovation vitality of enterprises[7]. The government can regularly hold AIGC technology application competitions to attract enterprises and research teams to participate, and promote excellent cases through media publicity, creating a social atmosphere that encourages innovation and tolerates failure.

7.3. Industry level strategy

7.3.1. Promoting Industrial Collaboration and Innovation

Enterprises in the traditional manufacturing industry in Wenzhou should strengthen cooperation and jointly carry out the application and innovation of AIGC technology to form industrial synergy effects. Industrial collaboration is an important way to promote digital transformation, especially in the early stages of technology application. Cooperation between enterprises can significantly reduce the technological risks and implementation costs of individual enterprises[9]. The application of AI often requires cross domain knowledge integration, so collaboration between enterprises can not only improve the efficiency of technology application, but also promote deep integration of the upstream and downstream of the industrial chain[6]. For traditional manufacturing industries in Wenzhou, cooperation between enterprises in technology research and development, data sharing, and market development can be promoted through the establishment of industry associations or alliances.

7.3.2. Building an Industrial Innovation Ecosystem

Building an industrial innovation ecosystem centered on AIGC technology is an important measure to promote the transformation and upgrading of Wenzhou's traditional manufacturing industry. AI can significantly improve the service-oriented level of manufacturing by changing production and delivery modes, and this process requires a high degree of integration of upstream and downstream resources in the industrial chain[2]. The formation of high-level enterprises cannot be separated from the support of a good industrial ecology, therefore, building an innovative ecology is of great significance for enhancing the overall competitiveness of the region[5]. By integrating elements such as technology, talent, and funding, an open and shared innovation platform can be created to promote efficient flow and allocation of resources. For example, establishing an innovation and entrepreneurship park with AIGC technology as its core in the Wenzhou region, attracting upstream and downstream enterprises, research institutions, and financial institutions to settle in, forming a complete industrial chain.

8. Conclusion

8.1. Research Summary

AIGC technology, as an important driving force for the new round of technological revolution and industrial transformation, has had a profound impact on the transformation and upgrading of Wenzhou's traditional manufacturing industry. In terms of technological empowerment, AIGC has significantly improved the innovation capability and efficiency of the design process, optimized the intelligent management and process control of the production process, and

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provided data-driven decision support for enterprise management through the application of data analysis, pattern recognition, and automation tools. Especially in supply chain management, this technology effectively reduces operational costs and improves response speed by accurately predicting market demand and optimizing inventory management. In addition, AIGC's multidimensional empowerment in Wenzhou's traditional manufacturing industry is not only reflected in the efficiency improvement of a single link, but also achieves collaborative optimization of the entire value chain by integrating upstream and downstream resources.

In the analysis of industrial adaptability, research has shown that there is a high degree of adaptability between AIGC technology and different types of industries and value chain links in Wenzhou's traditional manufacturing industry. In industries, such as electrical and shoe leather, this technology can be deeply integrated into research and development, production, and sales, significantly enhancing the value creation ability of key links. However, there are also many challenges in the process of industrial adaptation, including technological bottlenecks, high-cost investment, and shortage of professional talents. Nevertheless, the application of AIGC has brought significant opportunities for Wenzhou's traditional manufacturing industry to explore new markets, enhance industrial competitiveness, and promote industrial upgrading, thereby further promoting the high-quality development of the regional economy.

From the perspective of regional innovation, AIGC technology has stimulated the innovation vitality of traditional manufacturing enterprises in Wenzhou and promoted the deepening of industry university research cooperation. The impact of this technology on the regional innovation environment is particularly significant, not only giving rise to new policy demands, but also promoting the creation of an innovative culture, laying a solid foundation for the construction of the regional innovation system. By integrating innovative elements and building innovative networks, Wenzhou has gradually formed a regional innovation ecosystem centered on AIGC technology, significantly enhancing overall innovation capabilities.

The empirical analysis further confirms the positive role of AIGC technology in the transformation of traditional manufacturing industry in Wenzhou. Through regression analysis of enterprise research data and industry statistical data, it was found that there is a significant positive correlation between the degree of technology application and industrial transformation indicators, indicating that AIGC technology can effectively promote the transformation of Wenzhou's traditional manufacturing industry towards digitization and intelligence. This discovery provides important theoretical support and practical guidance for subsequent research and practice.

8.2. Research Prospects

Although this research has achieved certain results in the impact of AIGC technology on the transformation of traditional manufacturing industry in Wenzhou, there are still some limitations that need further exploration. Firstly, due to limitations in data acquisition, this research is mainly based on limited enterprise research data and industry statistical data, which may not fully reflect the actual application effect of AIGC technology in traditional manufacturing industries in Wenzhou. Future research can further enhance the universality and reliability of research conclusions by expanding sample size and introducing more multidimensional data sources. Secondly, this research mainly focuses on the impact of AIGC technology on the technological empowerment, industrial adaptation, and regional innovation of traditional manufacturing industries in Wenzhou. However, its potential impact on macro levels, such as social employment structure and ethics, has not been deeply explored. These issues deserve special attention in future research.

With the rapid iteration of AIGC technology, how to achieve dynamic matching between technology and industry demand will become an important direction for future research.

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Especially in the traditional manufacturing industry in Wenzhou, further exploration is needed to develop more targeted technology application strategies based on the characteristics of different industry types and scale enterprises. With the advancement of new technologies and changes in the external environment, the effectiveness of these strategies may need to be reassessed. Future research should pay more attention to the dynamic adjustment and optimization of strategies to ensure their ability to continuously adapt to changing market demands and technological trends.

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References

[1] Zheng S., Tao R. YW. The impact of AIGC technologies such as ChatGPT on industrial transformation and upgrading. Ind Econ Rev. 2024;(1):5-20.

[2] Lin S. JX. The Transformation of Traditional Manufacturing Industry in the AI Era. Acad Front. 2019;(18):28-36. doi:CNKI:SUN:RMXS.0.2019-18-006

[3] J. W. Thoughts on the Integration and Development of Artificial Intelligence and Traditional Manufacturing Industry in Zhejiang Province. Hangzhou Sci Technol. 2020;41(3):40-42.

[4] Jiao Y., Bo W., Ran F., Qian L. ZG. Discussion on the Enlightenment of Applying Artificial Intelligence to Traditional Manufacturing Industry in China. Manag Technol Small Mediu sized Enterp. 2021;5(8):40-41.

[5] Z. D. Analysis of the Impact of Artificial Intelligence on the Transformation and Upgrading of Manufacturing Industry. Econ Res Guid. 2022;(1):28-30.

[6] Cao Z., Tan Y. ZH. Artificial Intelligence Technology and the Direction of Enterprise Transformation: Analysis Based on Survey Data of Chinese Private Enterprises. Acad Exch. 2022;7:16. doi:10.3969/j.issn.1000-8284.2022.07.009

[7] Yao L. CL. An Siyang Analysis of the Path of Transformation and Upgrading of Traditional Manufacturing Industry under the Background of "Big Intelligence Moving Cloud." Bus Account. 2021;(9):15-18. doi:10.3969/j.issn.1002-5812.2021.09.004

[8] Lv R., Xu M. YL. The impact of artificial intelligence development on manufacturing employment: an analysis of the mediating effect based on consumption upgrading. Financ Econ. 2021;(7):63-71.

[9] M. X. Research on the Digital Transformation Path of Manufacturing Industry Based on Artificial Intelligence. Intell Manuf. 2024;(3):10-18.

[10] C. M. Artificial Intelligence and Manufacturing Serviceization. Econ Manag Res. 2023;44(7):22-39. doi:10.13502/j.cnki. issn1000-7636.2023.07.002

[11] Liu S. MQ. Research on the Impact and Effect of Artificial Intelligence Technology on the Global Value Chain Upgrading of China's Manufacturing Industry. Ind Technol Econ. 2022;41(12):94-99.