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High-Quality Development Strategies for New Productivity under the Background of Industry-Education Integration

Xin Sun[a,*], Peng Chen[b], Qi Wu[c], Dan Zhao[d]

Electrical Engineering, Shenyang Polytechnic College, Shenyang, Liaoning, China
[a]sunxinsy@126.com, [b]706364370@qq.com, [c]21140790@qq.com, [d]11zhaodan04@163.com
**Corresponding author*

Abstract: *Concerns have been expressed about graduates' inadequate skills in the workplace and the gap between talent development and enterprise technology deployment. This article suggests an integrated industry-academia-research strategy based on "new high-quality productivity" to address these problems by closely integrating high technologies with vocational education, including artificial intelligence, big data, cloud computing, and RPA. Its objectives are to improve graduates' professional skills, increase corporate efficiency and technological innovation capabilities, and optimize the system for cultivating talent in higher education. This strategy accomplishes this purpose by fostering integrated education initiatives and industry-academia-research joint training projects, as well as by building a multi-level collaborative education system among universities, businesses, and research organizations. Students' learning outcomes, skills, and capacities have all improved, according to experimental studies. By enhancing students' professional skills and businesses' technology application capabilities, this new high-quality productivity model that integrates industry, academia, and research may support effective and superior industrial development.*

Keywords: *New Quality Productivity; Industry-Education Integration; Higher Vocational Education; Artificial Intelligence; Big Data*

1. Introduction

Traditional productivity models are no longer adequate to fulfill the needs of contemporary industrial upgrading and high-quality development due to the global economic digital revolution and the rapid advancement of high technology. To successfully cultivate talent through industry-academia-research partnerships, a strong relationship between industry, academia, and research is necessary to support talent development along the entire industrial chain.

Due to a number of problems, including outdated curricula, a large gap between theory and practice, and insufficient integration of academia, industry, and research, vocational schools today struggle to produce industrial talent. Because of this, graduates' professional skills fall short of what companies truly require in terms of skilled and technical personnel. Businesses also have to deal with issues like poor rates of industrialization of new productivity technologies and inadequate talent reserves, which make it difficult for them to be applied effectively in production and innovation activities. This "supply-demand mismatch" hinders the industry's capacity for ongoing innovation as well as the efficient growth of high-quality productivity.

To address the aforementioned issues, this paper takes higher vocational education as its starting point, exploring how to promote the high-quality development of new productive forces within the context of industry-academia-research integration. This paper focuses on the application of high technologies such as artificial intelligence and big data in industry, combining them with school-enterprise cooperative education. It aims to provide a systematic approach to talent cultivation and technology application, optimize the professional capabilities of college graduates, improve enterprise production efficiency, and support the efficient operation of new productive forces in industry, thereby providing a reference for building a technology-driven and talent-strengthened modern industrial system.

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2. Related Works

Regarding the connotation and formation mechanism of new quality productivity, existing research has systematically explored from macro-strategic layout to micro-organizational practice, providing important theoretical support for the relevant research in this paper. DENG et al. pointed out that compared with traditional productivity, new quality productivity has the characteristics that data and information are key elements; disruptive innovation is the fundamental source, and it can realize the green and low-carbon transformation of the whole society and generate strong spillover effects. These together constitute the basic framework of new quality productivity in the industrial field [1]. Tang explored the concept of New Quality Productivity (NQP) and regarded it as a strategic shift of China's economic development towards a more sustainable and innovation-driven model. He examined the core elements of new quality productivity, including technological innovation, integration with emerging industries, and the role of data as a key production factor [2]. In order to strengthen the enterprise-led industrial science and technology innovation system and accelerate the development of new quality productivity, YIN et al. proposed policy recommendations to cultivate and strengthen leading science and technology enterprises, improve and make good use of the new national system, strengthen the deep integration of industry, academia and research led by enterprises, seize the opportunities of scenario-driven paradigm, support the development of platform enterprises, and stimulate the innovation vitality of all people [3]. Deng examined the current status of technological innovation and management practices in manufacturing enterprises by clarifying the intrinsic connection and interaction mechanism between technological innovation and management under the framework of new high-quality productivity, and identified key challenges that hinder collaborative development [4]. JIN pointed out that with the rapid development of technological innovation, especially digitalization and AI technology, repetitive work is largely replaced; new creative work emerges; management work is optimized [5]. Mahardhani adopted a qualitative research method. The results showed that public policy plays a crucial role in encouraging technological innovation and sustainable development, and is essential for achieving a sustainable and advanced future [6]. Manigandan et al. selected data from 1990 to 2020 and used a method that can effectively handle cross-sectional correlation, heterogeneity and endogenous panel data. The main analytical results showed that a higher level of financial development, increased primary energy consumption and technological innovation can improve the per capita economic growth rate of BRICS countries [7]. NIE et al. analyzed the integration of the "four chains" and put forward the following suggestions: first, the systematic layout and implementation of science and technology innovation policies are promoted; second, the construction of "large-scale science and technology intermediaries" is explored, and a consultation decision-making mechanism and market pricing mechanism that conform to the laws of innovation are built [8]. Chen and Wang used a coupling coordination degree model to estimate the coupling degree of the two chains and used the generalized method of moments for dynamic panel systems to analyze the impact of government support on the coupling degree of the two chains. The results of this study showed that the severe imbalance of the coupling degree of the two chains is the main obstacle to the development of IC enterprises [9]. Lulu explained the connotation of innovation chain and industrial chain respectively, then refined the connotation of the integration of innovation chain and industrial chain, and proposed two integration models: innovation chain promotes industrial chain and industrial chain drives innovation chain [10]. However, existing research mostly stays at the level of conceptual discussion and qualitative analysis, lacking an operable mechanism and quantitative evaluation system for specific scenarios, and there is still a disconnect between theory and practice.

3. Methods

3.1 New Productivity Development Driven by Science and Technology Talent

New-quality productivity refers to productivity centered on high-tech innovation (such as artificial intelligence and big data), based on science and technology, and driven by innovation. In real-world examples, factories use machine vision and deep learning algorithms, combined with IoT technology, to automatically identify images of automotive parts and automate quality inspections of defective components. Similar high-tech advancements are empowering enterprise production efficiency across various industries. With the continuous innovation of high technology, all industries should keep pace with the times, abandoning traditional, outdated vocational training methods and improving the technological capabilities of their personnel. In intelligent manufacturing, AI algorithms and big data analysis provide means for production optimization, while data scientists, engineers, and operators are

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responsible for model design, algorithm optimization, and production execution. Only when they work together can new-quality productivity be genuinely created, leading to gains in productivity, quality, and capacity for innovation. The idea of "talent as the primary resource" should be upheld in education, and its procedures and methods should be aggressively reformed. Modern research, technology, and economic development cannot be sustained without robust talent support. Enhancing human resource development programs and putting in place reliable reward systems are crucial for creating new-quality productivity. Talent is the driving force behind the creation of new-quality productivity.

Universities should offer top-notch research environments and policy support since they are important players in scientific research. Universities may create more labs, improve sensor equipment, and expand research funds for instructors and students in fields such intelligent robot control systems, image recognition, artificial intelligence algorithms, IoT technologies, and automation resource optimization. In order to achieve industry-academia collaboration, align university instructional goals with corporate talent needs, improve the efficiency of modern industrial system construction, and foster the development of new productive forces, enterprises should actively participate in the talent cultivation process of universities. For example, accounting professionals can no longer rely on traditional manual bookkeeping. Unlike students, accountants in the workplace can utilize more convenient algorithms and cloud computing for bookkeeping and report review. Cloud-based financial systems centrally process data from multiple departments and regions within an enterprise, while RPA (Robotic Process Automation) handles repetitive reports and accounting. If university education continues with traditional methods, the workplace skills of graduates from various majors inevitably fail to meet market demands. University education should collaborate with enterprise vocational education to optimize talent development and avoid the current phenomenon of "graduation equals unemployment".

"Industry-education integration", guided by "new quality productivity", is an important measure to improve the quality of higher vocational education and cultivate high-caliber technical and skilled personnel. To build a new model for cultivating high-quality, highly skilled talent, it is essential to deeply promote the integration of industry, academia, and research.

3.2 Industry-Education Integration and the Cultivation of New-Quality Productivity Talents

First, vocational schools should break through the limitations of traditional education models, shedding the constraints of disciplines and majors, and actively build vocational education alliances and regional platforms for industry-academia-research cooperation. Simultaneously, they should closely collaborate with emerging productivity enterprises, engaging in in-depth cooperation to construct a work-study integrated talent training system that respects and integrates moral education and skills, providing strong support for future talent development and employment. Schools should pay closer attention to industry development trends, utilizing emerging technologies such as artificial intelligence and big data to innovate curriculum systems, ensuring the integration of vocational education with industrial development and providing strong talent support for building a strong education nation. Schools can obtain the latest industry data through industry reports and market research. Sending teachers to work in enterprises and research institutions not only allows them to reconnect with industry but also prevents them from becoming detached from industry during their time teaching in universities, thus ensuring, to a certain extent, that they possess teaching content with greater market value, rather than being limited to theoretical teaching.

Secondly, vocational schools must focus on the realization and development of new productive forces, establishing a multi-level collaborative education system involving the government, schools, enterprises, and research institutions. Schools should actively participate in technological research and development, implement high-tech projects, and promote interaction between research teams and enterprises to jointly advance the industrialization of research results. Firstly, based on the orientation of new productive forces, a scientific and reasonable collaborative mechanism for industry-academia-research application should be established, clarifying the responsibilities and rights of all parties in the process of technological research and development and talent cultivation, and constructing a new model of virtuous cooperative development based on complementary advantages, resource sharing, and risk sharing to promote the development of high-level vocational schools. To avoid financial or personnel losses due to project failures, schools can establish a risk-sharing mechanism to alleviate the research pressure of projects.

Third, a diversified educational structure should be established, and the integration of industry and education should be deepened to form a coordinated development ecosystem of "industry, academia,

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and research." Higher vocational colleges should cooperate with industrial enterprises and research institutions to build open industry-education integration training bases and technology transfer centers, promote enterprise participation in professional planning, textbook development, and internship training, promote the combination of theory and practice, improve students' innovation and practical abilities, and provide the industry with high-quality skilled personnel.

3.3 Construction of Multi-Chain Collaborative Mechanism Guided by New Quality Productivity

From the perspective of the talent ecosystem, the talent chain is formed by the interaction of different types of talent (such as scientists, engineers, designers, businesspeople, entrepreneurs, etc.) through knowledge creation and application. The talent chain achieves the "co-evolution" of talent cultivation, talent introduction, and talent development over time. The integration mechanism of the innovation chain, industry chain, and talent chain in the field of artificial intelligence is complex, driven by multiple factors, systematically coupled, and dynamically evolving. The innovation chain, as a source of technology supply, promotes the high-quality development of the artificial intelligence industry. Product development, market creation, value realization, and even the direction of technological research and development through market feedback are all dependent on the successes of the innovation chain, also referred to as the technology chain. Additionally, through the accumulation and spillover of knowledge capital, the talent chain facilitates the movement of components and embedded capabilities between various industry chains as a link between technological research and development and production practice.

The idea of "science and education integration," which refers to how universities convert research materials into instructional materials so that students can learn about cutting-edge theories and technologies and develop their scientific literacy and creative skills, is the source of both the education chain and the innovation chain. The innovation chain is made up of universities and businesses that emphasize the application and transformation of research findings, whereas the education chain is mostly made up of research-oriented universities that concentrate on fundamental research. These two chains work together to drive universities to revamp their talent development programs, creating a positive feedback loop between research findings and business demands.

Building a strong link between industry, academia, and research to support talent development along the whole industrial chain is essential to achieving successful talent cultivation through industry-academia-research partnership. Each link in the industry chain should have a corresponding curriculum system, and adjustments to the curriculum system directly affect the structure of the education chain. The development of the industry chain drives the transformation of the education chain, while the education chain supports the industry chain by supplying innovative talent, thus contributing to industrial upgrading. The two mutually promote each other in an effective way, supporting the coordinated development of the industry chain and the education chain, thereby attracting and retaining talent.

4. Results and Discussion

4.1 Experimental Subjects

At the higher education level: Vocational/undergraduate programs participating in industry-education integration projects (such as accounting, computer science, intelligent manufacturing, data analysis, etc.)

Student groups: Experimental class (participating in industry-academia-research/industry-education integration courses) and control class (traditional teaching).

At the corporate level: Companies that collaborate with universities participate in internships, technology research and development, and training programs.

4.2 Experimental Variables

Independent variables (intervention):

Participation in industry-academia-research projects (yes/no)

Industry-education integration curriculum/practical training model (applying new high-quality

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productivity technologies, such as AI and big data)

Dependent variable (outcome indicator):

Student vocational ability level

Technical competence (skills test/project completion rate)

Innovation ability (innovative works/problem-solving ability)

Practical skills (internship performance evaluation)

Enterprise/Industry Indicators

Technology application rate (the rate of transformation and application of scientific research results in universities)

Enterprise production efficiency / project completion efficiency

Corporate job competency assessment (recruitment feedback, employee performance)

4.3 Experimental Methods

A controlled experiment compares the post-graduation performance of students in industry-academia-research/industry-education integration programs with those in traditional programs. Case studies select typical enterprise-university collaborative projects to analyze the transformation of research results, talent matching, and industry development.

4.4 Experimental Procedure

(1) Selecting universities and partner companies

(2) Students are divided into experimental classes (participating in industry-university-research/ industry-education integration projects) and control classes.

(3) A 1-2 year course and practical training intervention are conducted.

4.5 Real-World Case Studies

Experimental Class Case

Student A: In a smart manufacturing training session, he discovered an abnormally high defect rate in a batch of electronic components on the production line. He used Python for data cleaning and visualization, combined with machine learning to predict defect trends, and utilized RPA to capture production logs, quickly locating abnormal temperature issues in the welding process. By adjusting the process, the defect rate was reduced from 3% to 1%.

Student B used RPA to automatically generate accounting reports and a cloud-based financial system to incorporate data from various sources. Simultaneously, he created algorithms to detect anomalous accounts. Compared to standard manual accounting, the data processing speed was three times faster and the error rate was significantly reduced.

Student C: Using big data analysis and AI optimization techniques, Student C examined vehicle transportation routes to adjust delivery schedules for the logistics scheduling simulation project. In the project, he was able to reduce delivery time by 15% and increase vehicle usage by 20%. The corporate training mentor praised his inventiveness and practical abilities as outstanding.

Control Class Case Studies

Student D: Faced with the same electronic component defect problem, Student D still used traditional statistical methods to analyze data. However, lacking automated tools, it was difficult to quickly locate production anomalies, resulting in no significant reduction in the defect rate.

Student E: When processing cross-regional reports, Student E relied on manually summarizing data from various locations, which was time-consuming and prone to errors, leading to low report processing efficiency and a high error rate.

Student F: In the logistics scheduling project, students in the control class mainly relied on manual calculations and experience-based route adjustments, resulting in limited optimization effects. The

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improvement in delivery time and vehicle utilization was far lower than that of the experimental class, indicating a lack of innovation.

4.6 Summary

Through their involvement in industry-academia-research and industry-education integration courses, students in the experimental class are exposed to state-of-the-art tools and technology in actual business settings. This enables them to use automation, smart algorithms, and data analysis in a flexible way to address real-world issues. Students can greatly enhance their professional skills, creativity, and practical abilities by using machine learning to predict production defects, automating cross-regional financial reporting using RPA, and optimizing logistics scheduling by combining big data and AI. Students in the control group, on the other hand, continue to use conventional approaches, which leads to low productivity, a lack of creativity in problem-solving, and challenges in swiftly adjusting to challenging assignments or streamlining production procedures.

These examples clearly show how the industry-academia-research and industry-education integration models, as independent variables, can greatly improve students' all-around professional skills, giving them a competitive edge in innovative practice, problem-solving, and technology application. They also demonstrate how this paradigm improves job competency and the effectiveness of technology implementation in businesses. In other words, the gap between graduates' skills and the demands of the workplace under the conventional education paradigm can be successfully closed by closely integrating education with the real needs of businesses and introducing new productivity-related technology.

5. Conclusions

The formation of new productive forces against the backdrop of industry-university-research integration is examined in this paper, along with its synergistic effect mechanism on the development of high-tech talent. Through an analysis of the dual-system cooperative education model between universities and businesses, as well as a comparison of the employment matching, professional abilities, and enterprise technology application effects of graduates in the experimental and control groups, the findings demonstrate that: 1) Industry-university-research integration can improve students' professional abilities, innovation competencies, and practical knowledge, enabling graduates to exhibit stronger employability and practical skills in an enabling atmosphere compared to conventional higher education setting; 2) Building a multi-chain cooperation mechanism, particularly the link between the innovation chain, industrial chain, and talent chain, can create a dynamic and effective new productive force ecosystem, thereby encouraging industrial structure upgrading and high-quality development; 3) Deeply integrating university study outcomes with actual enterprise production can significantly improve the technologies application rate, R&D efficiency, and production efficiency of newly established effective companies enterprises, thereby accelerating the transfer to market of innovative accomplishments. This study has several limitations even though the findings indicate that the industry-education integration model has a major impact on industrial upgrading and talent cultivation. First, there is limited industry and regional coverage in the experimental sample, which primarily focuses on a few higher vocational colleges and cooperative enterprises; second, the data collection period is relatively short, making it challenging to evaluate the long-term sustainability of industrial innovation and talent cultivation. Future research can expand the sample scope to cover more industries and regions, and further optimize the industry-education integration model through long-term tracking surveys and big data analysis, exploring high-quality development strategies for new productivity in different industrial scenarios.

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