The Predicament and Breakthrough Directions for high-quality Employment of Vocational College Graduates in the Manufacturing Industry

Jinling Chen
Zhejiang Polytechnic University of Mechanical and Electrical Engineering, Hangzhou, Zhejiang, China

Abstract: This paper focuses on the multiple predicaments faced by vocational college graduates in achieving high-quality employment in the manufacturing industry, systematically analyzing the core contradictions such as the structural mismatch between skill supply and industrial demand, institutional blockages in career development channels, and social cognitive biases and career identity crises. Through empirical research and case analysis, this paper reveals the deep-seated constraints imposed by traditional education models, enterprise employment mechanisms, and social and cultural concepts on the career development of vocational college graduates. Furthermore, three major paths to break through the predicament are proposed: deeply reconstructing and solving the imbalance between the supply and demand of skills through the integration of industry and education, achieving dynamic adaptation of ability evaluation and industrial demands through the innovation of the vocational ability certification system, and comprehensively optimizing and constructing an inclusive vocational support system based on the vocational ecosystem. The research emphasizes that it is necessary to integrate the education chain, talent chain, industrial chain and innovation chain with systematic thinking, promote the transformation of technical and skilled talents in the manufacturing industry from "scale supply" to "quality empowerment", and provide sustainable talent support for industrial upgrading and high-quality employment.

Keywords: Graduates from Higher Vocational Colleges ; Manufacturing Industry; High-Quality Employment; Integration of Industry and Education; Professional Competence

1. Introduction

As a pillar industry of the national economy, the high-quality development of manufacturing urgently requires the support of high-quality technical and skilled talents. However, vocational college graduates generally face the dual predicaments of "difficulty in employment" and "difficulty in retention" in the manufacturing sector: on the one hand, enterprises' "difficulty in recruitment" and graduates' "difficulty in job hunting" coexist, and the structural contradiction between the supply and demand of skills is prominent; On the other hand, the limited career development space and low social recognition of technical workers have led to a serious brain drain. The essence of this contradiction lies in the fact that the traditional vocational education system, the employment mechanism of enterprises and social cultural concepts have failed to adapt to the demands of industrial technological transformation. This article deeply analyzes the constraints on high-quality employment of vocational college graduates in the manufacturing industry from three dimensions: skill matching, institutional guarantee, and social recognition. It also explores breakthrough paths such as industry-education integration, certification innovation, and ecological optimization, aiming to provide theoretical references and practical guidance for the construction of a "education-industry-talent" coordinated development mechanism.

2. Analysis of the Connotation and Current Situation of High-Quality Employment in the Manufacturing Industry

2.1 Multi-Dimensional Definition of High-Quality Employment in Manufacturing

The definition of the connotation of high-quality employment in manufacturing for vocational college graduates needs to break through the traditional single perception of "high salary and stability", and shift to a multi-dimensional integrated evaluation system that combines economic value, technological empowerment, career growth and social contribution. The economic value dimension not only focuses on the initial salary level but also emphasizes the support of positions for personal income growth potential. For instance, in the field of intelligent manufacturing, vocational college students with industrial robot operation and maintenance skills have a salary increase of 40% higher than that of traditional operators, demonstrating the amplification effect of technological premium on economic returns. The dimension of technological empowerment focuses on the promoting effect of positions on the technological upgrading of industries. For instance, the participation of vocational college graduates in the improvement of the assembly process of new energy vehicle battery modules has reduced the product defect rate by 28%. Such technological contributions should be the core indicator for measuring the quality of employment. The dimension of career growth examines the clarity and sustainability of the skill iteration path. Under the German "dual system" model, vocational apprentices need to pass an industry skill certification every two years, and their promotion cycle is 60% shorter than that of non-certified individuals, highlighting the importance of institutionalized growth channels. The dimension of social contribution emphasizes the shaping of regional industrial chain security and skill ecosystem by employment. For instance, when vocational college students solve precision processing problems in "specialized, refined, distinctive and innovative" enterprises, it drives technological collaborative innovation among upstream and downstream enterprises. Such external benefits need to be incorporated into the employment quality assessment framework[1].

2.2 The Employment Structure Characteristics of Higher Vocational College Graduates in the Manufacturing Industry

The employment structure characteristics of vocational college graduates in the manufacturing industry show a significant trend of stratification and differentiation. From the perspective of industry distribution, the employment concentration is highly correlated with the technological intensity of the industry - approximately 65% of the graduates are concentrated in traditional technology-intensive industries such as automotive manufacturing, electrical machinery, and general equipment, while the employment proportion in strategic emerging industries such as new-generation information technology and high-end equipment is less than 15%, reflecting a structural mismatch between the supply of vocational skills and the cutting-edge demands of the industry. At the enterprise type level, small, medium and micro enterprises have become the main employment carriers, absorbing over 70% of vocational college graduates. However, these enterprises generally have problems such as backward technical equipment and missing training systems, which result in the skill iteration speed of graduates being more than 30% slower than that of leading enterprises, and the job stability being significantly lower than that of large-scale enterprises. In terms of job levels, most vocational college students are in basic technical positions such as production operation and quality inspection, while core positions like technology research and development and process improvement account for less than 20%. Moreover, the average job promotion cycle is 5.2 years, which is 1.8 years longer than that of undergraduate students. This "skill lock-in" effect restricts their career development space[2]. In addition, regional employment disparities are prominent. The demand intensity for vocational college students in the manufacturing clusters of the Yangtze River Delta and the Pearl River Delta is 2.3 times that of the central and western regions, further exacerbating the imbalance in the employment structure.

2.3 New Requirements for Employment Quality Brought about by the Transformation and Upgrading of the Manufacturing Industry

The transformation and upgrading of the manufacturing industry is reshaping new standards for employment quality from three dimensions: technological iteration, production models, and industrial ecosystems. At the level of technological iteration, the popularization of emerging technologies such as intelligent manufacturing and industrial Internet requires vocational college graduates to transform from

single operational skills to a compound structure of "digital skills + professional capabilities". For instance, technical workers who master the programming and debugging of industrial robots have an employment competitiveness that is 50% higher than that of traditional equipment operators, and their salary premium reaches 30%. This highlights the decisive role of digital skills in the quality of employment. In terms of production mode transformation, new models such as flexible manufacturing and personalized customization have driven positions to shift from "standardized execution" to "problem-solving and innovation". Enterprises are more inclined towards technical talents with the ability to improve processes and the awareness of cross-process collaboration. A survey conducted by a certain auto parts enterprise shows that the probability of vocational college students with the ability to propose innovative proposals being promoted to management positions is 2.6 times that of ordinary employees. The reconstruction of the industrial ecosystem emphasizes the ability of supply chain collaboration and full life cycle management. Vocational college graduates need to possess cross-border capabilities such as cross-enterprise technology connection and application of green manufacturing standards to adapt to the new employment scenarios under the global value chain reconstruction[3]. These changes all point to a core trend: high-quality employment in manufacturing is shifting from a competition based on "skill proficiency" to a dual game of "technological adaptability and innovation contribution".

3. Multiple Predicaments for High-Quality Employment of Vocational College Graduates in the Manufacturing Industry

3.1 Structural Mismatch Between Skill Supply and Industrial Demand

The primary predicament that vocational college graduates face in manufacturing employment is the structural mismatch between skill supply and industrial demand. As the manufacturing industry accelerates its transformation towards intelligence and greenness, the demand for technical workers' capabilities by enterprises has shifted from single operational skills to a composite structure of "digital skills + professional qualities + innovation capabilities". However, the current higher vocational education system still mainly focuses on traditional skills training, and the update of the curriculum system lags behind the speed of industrial technology iteration. For instance, 70% of higher vocational colleges' industrial robot majors do not offer emerging courses such as industrial Internet platform operation and maintenance and machine vision debugging, which leads to an adaptation period of 6 to 8 months for graduates in intelligent manufacturing scenarios. Far exceeding the enterprise's expectation of within three months[4]. Meanwhile, there is a deviation between the actual demands of enterprises and the training goals of educational institutions. A survey conducted by a certain equipment manufacturing enterprise shows that only 35% of the vocational college students it recruits can directly take on technical positions, while the rest need to undergo secondary training for 6 to 12 months. This contradiction of "learning but not applying" not only increases the enterprise's labor costs but also weakens the employment competitiveness of graduates. This creates a paradox where "enterprises have difficulty recruiting workers" and "graduates have difficulty finding jobs" coexist..

3.2 Institutional Obstruction of Career Development Channels

The career development path for vocational college graduates in the manufacturing sector is encountering a profound conflict between the institutional framework and the demands of industrial transformation. The essence of this conflict lies in the systematic neglect of the growth laws of technical and skilled talents by the traditional career promotion system. From the perspective of enterprise systems, manufacturing enterprises generally follow a dual-channel model of "management sequence - technical sequence". However, the salary bandwidth and say of the management channel are significantly higher than those of the technical channel. As a result, even if vocational college graduates are promoted to senior technicians through skill certification, their salary levels are still 28% to 35% lower than those of managers at the same level. This value orientation of "emphasizing management over technology" directly weakens the intrinsic motivation of technical workers to delve deeply into their professional skills. What is more worthy of attention is that the technology sequence itself has a serious "ceiling effect" -

according to a survey of the manufacturing clusters in the Yangtze River Delta, only 12% of enterprises have set up the position of chief technician in the technology sequence, and their selection criteria are often linked to academic qualifications, forming an implicit promotion barrier of "higher vocational education - senior worker - technician" This has led to a large number of vocational college graduates with innovative potential encountering career bottlenecks at the "intermediate worker" stage.

From the perspective of the industry certification system, there is a significant time lag between the current skill level assessment system and the industrial technology iteration. Although the national vocational qualification directory has included emerging occupations such as industrial robot operation and additive manufacturing in the scope of certification, the assessment standards of local human resources and social security departments still mainly focus on equipment operation norms, lacking evaluation modules for cutting-edge technologies such as digital twins and predictive maintenance. This has led to a "mismatch" between the skill certificates obtained by vocational college graduates and the actual demands of enterprises. Meanwhile, the internal certification system led by leading enterprises in the industry has not yet formed a cross-enterprise mutual recognition mechanism. For instance, a certain automotive group requires that the technical workers of its suppliers must pass the internal certification of the enterprise, but this certification is not recognized enough in foreign enterprises or small and medium-sized enterprises. This phenomenon of "enterprise certification islands" further restricts the career mobility space of vocational college graduates.

3.3 Social Cognitive Bias and Professional Identity Crisis

The social cognitive bias and professional identity crisis that vocational college graduates face in the manufacturing field have become deep-seated cultural shackles restricting their high-quality employment. At its core, it is the intense collision between the traditional social stratification concept and the demands of modern industrial transformation. From the perspective of social cognition, manufacturing occupations are still generally labeled as "low-skilled", "high-intensity", and "low-dignity". This stereotype is constantly reinforced in the binary narrative of "white-collar - blue-collar" - research data shows that over 65% of respondents believe that manufacturing jobs "lack creativity" However, only 28% of parents support their children in choosing manufacturing-related majors in higher vocational colleges. This "stigmatization" effect of social evaluation directly leads to higher vocational college graduates frequently encountering the double squeeze of "degree discrimination" and "career prejudice" in the job-hunting process. Even in emerging fields such as intelligent manufacturing, enterprises are more inclined to recruit undergraduates for technician positions. Limiting vocational college students to the level of operators creates a negative cycle of "social perception - enterprise employment"[5].

The crisis of professional identity is manifested as the disconnection between the realization of individual value and professional social status. Although technical workers in the manufacturing industry play a key role in industrial upgrading, their labor value has not yet been socially recognized. On the one hand, highly skilled senior technicians still have significant gaps with managers at the same level in terms of salary and benefits, and the "hidden ceiling" of professional reputation restricts their social mobility space. On the other hand, although media reports on "great craftsmen of the country" have enhanced the visibility of the profession, they often deify them as moral symbols of "selfless dedication", ignoring the reasonable demands of technical workers as ordinary laborers. This "dehumanized" narrative has instead intensified the sense of alienation in professional identity. What is even more serious is that vocational college graduates generally show a "de-skillization" tendency in their career choices - in the past five years, the industry transfer rate of vocational college graduates in manufacturing has been as high as 37%, among which over 60% have gone to non-technical positions such as sales and administration. This "voting with one's feet" behavior is essentially the result of internalizing social cognitive biases into individual career expectations.

The absence of symbolic capital in the vocational education system has further magnified the identity crisis. In their enrollment promotion, higher vocational colleges overly emphasize "employment rate", but avoid core issues such as "employment quality" and "career

development", resulting in students lacking an identification with the value of manufacturing occupations from the very beginning of their enrollment. The "instrumental rationality" orientation in enterprise training makes it difficult for technical workers to gain creative satisfaction from their work. The absence of the dual values of "education and enterprise" eventually pushes vocational college graduates into a nihilistic predicament of professional identity.

4. Exploration of the Path to Break Through the Predicament of High-Quality Employment

4.1. Deep Reconstruction of Industry Education Integration

To break through the predicament of high-quality employment in manufacturing for vocational college graduates, the in-depth reconstruction of industry-education integration has become the core approach to resolving structural contradictions. Its essence lies in building an ecosystem where the "education chain - talent chain - industrial chain - innovation chain" are coordinated, achieving a dynamic match between skill supply and industrial demand. From the perspective of mechanism innovation, it is necessary to break away from the traditional "loose cooperation between schools and enterprises" model and shift towards the construction of "substantive operation" industrial colleges. For instance, the "Lighthouse Factory College" jointly established by a certain vocational college in Guangdong and a leading enterprise in intelligent manufacturing has achieved a deep integration of "teaching projects as production orders and student works as product components" by embedding the real production scenarios of enterprises into the curriculum system. It has shortened the timeliness of skills training from the traditional model of 3 to 5 years to 1 to 2 years, effectively solving the problem that courses lag behind technological iterations. More importantly, this kind of substantive operation requires a substantive breakthrough in the "dual-mentor" system: Enterprise technical backbones not only need to participate in course development, but also need to guide practical teaching throughout the process as "resident engineers". Their salaries are shared by the government, enterprises and schools in proportion, forming a sustainable incentive mechanism. Currently, in the pilot program in Jiangsu, this model has increased the participation rate of enterprise mentors from 23% to 67%, significantly enhancing the practicality of skills imparting.

From a spatial perspective, the integration of industry and education needs to break through the "boundary of school gates" and build a "regional technical and skill accumulation community". The practice of a certain equipment manufacturing industrial cluster in Zhejiang Province has exemplary significance: The local government took the lead in establishing the "Intelligent Manufacturing Industry-Education Alliance", integrating resources from higher vocational colleges, leading enterprises and industry associations to jointly build and share public technical service platforms such as the "Intelligent Welding Technology Center" and the "Digital Twin Laboratory". Enterprises outsource non-core production links to the institutions within the alliance. Students complete the full-chain training of "skill certification - project practice - innovation incubation" in a real production environment. This model of "government guidance, market-driven, and multi-party collaboration" has increased the matching degree between regional skill supply and industrial demand from 68% to 89%.

4.2 Innovation of the Professional Competence Certification System

The innovation of the vocational ability certification system is a key institutional breakthrough to solve the predicament of high-quality employment for vocational college graduates in the manufacturing industry. Its core lies in building a three-dimensional certification framework that dynamically ADAPTS to industrial technological changes and precisely meets the job ability requirements, in order to break the dual separation pattern of traditional academic qualification certification and vocational skills evaluation. From the perspective of the reconstruction of certification standards, it is necessary to break through the "knowledge-based" assessment paradigm and shift to a "competency-based" modular design - for instance, the German "Industry 4.0 Skill Badge" system breaks down emerging capabilities such as intelligent production line operation and maintenance and industrial big

data analysis into quantifiable and traceable micro-certification units Each unit includes a three-dimensional assessment of "theoretical assessment - virtual simulation - practical verification", enabling the certification results to accurately reflect the problem-solving capabilities of workers in complex technical scenarios. This "micro-certification + stacked" design allows vocational college graduates to flexibly combine certification modules based on regional industrial characteristics, forming personalized ability maps. It effectively resolves the contradiction between the traditional certification being "big and comprehensive" and the job requirements being "small and precise".

More importantly, the diversified expansion of certification subjects requires the formation of a collaborative mechanism featuring "government guidance, industry dominance, and enterprise participation". Industry associations should play the role of technical standard formulators, join hands with leading enterprises to build a "job competency model library", and update the weights of certification indicators in real time. For instance, the Yangtze River Delta Robot Industry Association releases the "Competency Standards for Industrial Robot System Maintenance Personnel" every quarter, which dynamically links the assessment proportion of skills such as PLC programming and visual recognition with the order structure of regional enterprises. Ensure the cutting-edge nature of the certified content; Enterprises, on the other hand, need to deeply participate in the certification system through the "mutual recognition of certification results" mechanism. For instance, a certain automotive group has linked its internal certification with the national vocational qualification directory. Those who pass the senior technician certification can directly obtain the "technician" vocational skill level certificate. This two-way empowerment of "enterprise certification - national endorsement" has significantly enhanced the social recognition and professional value of the certification.

The innovation of the certification system also requires the application of new technologies such as "digital twin" to build a closed-loop system of "lifelong learning - dynamic certification". By using blockchain technology to record the skill improvement trajectory of workers throughout their entire careers, non-academic experiences such as enterprise training, competition awards, and innovation achievements are transformed into accumulable "skill points", forming a dynamic certification model of "initial certification - continuous update - ability evolution", enabling the career development of vocational college graduates in the manufacturing industry to shift from "phased promotion" to "gradual growth". Ultimately, achieve the synchronous resonance between the professional ability certification system and industrial technological transformation.

4.3 All-round Optimization of the Professional Ecosystem

The all-round optimization of the professional ecosystem, as a systematic project to break through the predicament of high-quality employment in manufacturing for vocational college graduates, needs to take the multi-dimensional interaction of "people - positions - organizations - society" as the logical main line and build a professional ecosystem that attaches equal importance to inclusive growth and sustainable development. From an organizational perspective, manufacturing enterprises urgently need to break the rigid constraints of the "bureaucratic system" on the career development of technical workers. By introducing new organizational forms such as "project-based" and "platform-based" systems, they can grant technical workers substantive powers such as cross-departmental collaboration and technical decision-making. For instance, a certain new energy enterprise has implemented the "Technical project manager" system. Allowing senior technicians to take the lead in forming cross-disciplinary research teams, with their salaries directly linked to the innovation benefits of the projects, this "de-administratized" power restructuring not only stimulates the innovative potential of technical workers but also shortens the breakthrough cycle of key technologies for enterprises by 40%, creating a win-win situation of "individual growth - organizational efficiency".

The improvement of the social support system requires breaking the governance predicament of a "single subject" and building a "professional ecosystem" where the government, enterprises, communities and families work together. The government should play the role of a provider of systems and guide enterprises to increase investment in the training of skilled workers through policy tools such as tax incentives and subsidy preferences. For instance, in Germany's

"dual system" vocational education, the government offers a 50% fiscal subsidy for the practical training costs borne by enterprises, and at the same time, reduces or waives social insurance premiums for enterprises that sign long-term training contracts. This "incentive compatibility" system design Enable enterprises to shift from "passive participation" to "active investment"; Communities can build public Spaces such as "Skill Sharing Workshops" and "Career Experience Centers" to provide platforms for cross-enterprise communication and technological iteration learning for skilled workers, promoting the flow and value-added of tacit knowledge within industrial clusters. At the family level, it is necessary to gradually dispel the stereotype that "blue-collar workers are inferior" through media promotion, community activities and other means, and create a social and cultural atmosphere that respects skills and values innovation.

5. Conclusions

To solve the predicament of high-quality employment for vocational college graduates in the manufacturing industry, systematic reforms are needed to address complex challenges. The in-depth reconstruction of industry-education integration has achieved a dynamic adaptation between skill supply and industrial demand through innovative models such as "physical industrial colleges" and "regional technical and skill communities". The innovation of the professional ability certification system, through means such as "micro-certification + stacked" design and blockchain technology empowerment, has constructed a three-dimensional framework for ability evaluation and career development. The all-round optimization of the professional ecosystem has created an inclusive professional growth environment through organizational transformation, the construction of social support networks and digital services. The concerted efforts of the three can not only enhance the employment quality and career stability of vocational college graduates, but also provide a technical and skilled talent team that is "usable, retained and well developed" for the transformation and upgrading of the manufacturing industry. Future research needs to further focus on the differentiated demands of industrial clusters in different regions and the profound impact of the new technological revolution on the occupational ecosystem, in order to continuously improve the support system for high-quality employment.

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