

Research on the Countermeasures for Training Technical Skills Talents in Intelligent Manufacturing Environment

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Abstract. Historical experience proves that the equipment manufacturing industry is a country's core competitiveness, and building an internationally competitive manufacturing industry is the only way for China to upgrade its national strength, safeguard national security, and build a world power. Since the implementation of the "Made in China 2025" strategy in 2015, the national manufacturing industry is undergoing intensive transformation and upgrading, and the corresponding technical skills training has become a hot issue in the field of vocational education. In this paper, the objectives and connotations of Industry 4.0 and intelligent manufacturing are elaborated. At the same time, the ability model of technical skills talents under the intelligent manufacturing mode is constructed. The countermeasures for the cultivation of intelligent manufacturing technology skills are studied.

1. Introduction

The State Council's notice on the issuance of "Made in China 2025" (May 8, 2015) states that manufacturing is the mainstay of the national economy, the foundation of the country, the instrument of rejuvenating the country, and the foundation of a strong country. Since the opening of industrial civilization in the middle of the eighteenth century, the history of the rise and fall of the world powers and the history of the struggle of the Chinese nation have repeatedly proved that without a strong manufacturing industry, there is no national and national prosperity. Building an internationally competitive manufacturing industry is the only way for China to upgrade its overall national strength, safeguard national security, and build a world power. From this we can see that the state attaches great importance to the promotion of the development of Industry 4.0 and has risen to the level of national policy. At the same time, we can also deeply understand that the equipment manufacturing industry represents the core competitiveness of a country; intelligent manufacturing will trigger a new round of industrial changes. Do not think that this issue is far from reality, developed countries are already on the road, we can't miss the future anymore. Therefore, under the background of Industry 4.0, China Manufacturing 2025, and global manufacturing transformation and upgrading, it is of great significance to carry out research on the cultivation of "smart manufacturing" technical skills talents to promote China's industrial upgrading and scientific and technological progress.

2. Intelligent Manufacturing and Industry 4.0

Manufacturing is the pillar industry of the national economy, the leading force of industrialization and modernization, the material security of national security and people's happiness, and an important indicator for measuring the comprehensive economic strength and international competitiveness of a country or region. History has proven that every major breakthrough in manufacturing technology and equipment has profoundly affected the competitive landscape of the world's powerful countries. The rise and fall of the manufacturing industry is a testament to the rise and fall of the world's powers. Vigorously developing the manufacturing industry is of great strategic significance for China to implement an innovation-driven development strategy, accelerate economic transformation and upgrading, and achieve a century-old national dream. We must persist in the determination and confidence in the development of the manufacturing industry, and through

the innovation and upgrading of the manufacturing industry, and we will build a solid foundation for a stronger country.

The two major themes of today's manufacturing are China Manufacturing 2025 (called Industry 4.0 in Germany) and smart manufacturing. With the advancement of science and technology and the development of human beings, artificial intelligence and intelligent manufacturing are the inevitable development of human society and history. Intelligent manufacturing is the main direction of China's manufacturing 2025, and it is also the commanding height of the country's "Internet +". There are many concepts of intelligent manufacturing. The relatively authoritative definition is: intelligent manufacturing refers to the integration of next-generation information technology such as Internet of Things, big data, cloud computing, and all aspects of production, management, and service activities. It has self-perception and self-decision. The general term for advanced manufacturing processes, systems, and models for self-execution and other functions. Intelligent manufacturing is not only the breakthrough and application of single technology and equipment, but also the deep integration and integration innovation of manufacturing technology, information technology and communication technology. Intelligent manufacturing mainly includes five areas: intelligent manufacturing equipment, intelligent control systems, intelligent industrial networks, intelligent decision management and intelligent manufacturing technology applications. The main content of Industry 4.0 (Made in China 2025) is the deep integration of Internet and manufacturing. To understand "Industry 4.0" must understand the deep integration. As shown in Figure 1, the physical combination of industrialization and informatization realizes Industry 3.0. Under this combination mode, the two can only promote each other, and industrialization and informationization can be distinguished. In the era of Industry 4.0, Industrialization and informatization have been integrated, and the combination of the two is full-scale, three-dimensional, and real-time interactive.

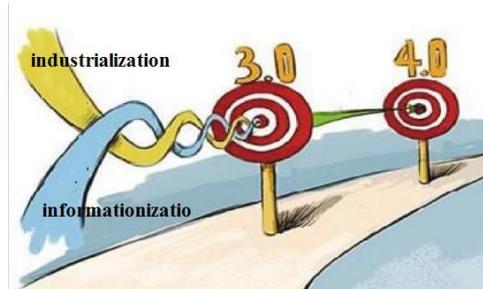


Figure 1. Deep Integration of Industrialization and Informationization.

The realization of intelligent manufacturing is not a one-step process. He will be a long-term process. It will go through the primary extremes, the embryonic stage, and the development stage. The first few stages will be long-term and difficult, but its development will be changing with each passing day. Perhaps the technology of the previous hour and the last hour can be thousands of times different, as shown in Figure 2. The realization of intelligent manufacturing will be the common goal of mankind. It needs the common development of the whole society to realize, realize the sharing, commonality and sharing of resources. At the same time, it also needs the development of human spiritual civilization. Only the spiritual civilization of all mankind has developed to a certain stage, humanity. In order to cooperate, share results, and run the entire intelligent environment system. It will be a propeller for achieving common prosperity for mankind.

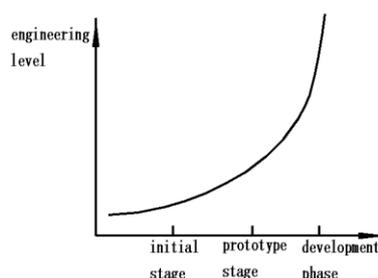


Figure 2. Trends in Smart Technology.

3. The Production Mode in the Intelligent Manufacturing Environment

With the advent of the intelligent manufacturing production model, information and technology will be more comprehensively integrated into people's production and lifestyle. In the intelligent manufacturing mode, human production and life will undergo the following changes: First, the machine will be replaced, and the robot will replace human beings to engage in more production and service work. Human beings will retreat from the front line of production to the behind-the-scenes of production and engage in equipment. R&D, debugging, service, etc. followed by machine intelligence. Under the advancement of artificial intelligence technology, robots will gradually undertake the analysis and problem-solving work like human beings, with richer perception, learning, judgment and decision-making. Ability, until it can replace most of the human brain labor; again in the era of big data, in the intelligent manufacturing environment, people's production work process will be recorded by data, and people's experience will be replaced by data, making it more accurate, Reliable, in addition, people's judgments and decisions will be supported by data, and decision-making will come from data; once again, the Internet of Things, equipment, tools and products in the production process will be connected to the Internet, enabling people and things to be interconnected, interoperable, and communicate with each other , production lines, factories, suppliers, products and customers are closely linked; The second is integration, the manufacturing process will integrate the design, manufacturing, sales, service and other aspects of the product, thereby greatly shortening the production process of the product and realizing the integration of the production process. The intelligent manufacturing practitioners are not only responsible for the manufacture of the product, but also Responsible for the entire life cycle of the product; once again, human-machine collaboration, the robot will no longer be fixed in a safe workplace, but work together with people; again, the product is the carrier of information, The product has its own information throughout the entire supply chain and life cycle. The product is an agent. The product will affect its environment. The product has self-monitoring function. The product will monitor its own state and environment, and then make judgments and decisions and take relevant measures.

In short, in the intelligent manufacturing mode, the difference between people and machines becomes smaller. With the advent of artificial intelligence, machines will become more and more like human beings, with the ability of perception, emotion, analysis, and problem solving. At the same time, human beings can implant and use memory chips like machines, and have large-capacity data storage. And efficient computing power. People and machines can cooperate and cooperate in production and life, as shown in Figure 3.



Figure 3. Human and Machine Co-Production.

4. The Ability Model Analysis

There have been three industrial revolutions in human history: for the first time, the emergence of steam engines made machinery and equipment widely used in production. Under this production mode, "technology" is the core competence of highly skilled personnel. Through technical learning and training, this can be solved. Various technical and production problems in the production mode; the second industrial revolution is represented by the invention of electric motors and the use of electric energy, which enables large-scale assembly lines to be applied to production. The skill of

this production mode is the core of highly skilled personnel. Competence requires practitioners not only to master technology, but more importantly, to have the ability to analyze and solve production problems; the third industrial revolution is the emergence of IT technology, which realizes automated production, and the “composite type” is highly skilled in this production mode. The core competence of talents requires practitioners to possess knowledge and skills in electromechanical, control, communication, management, and art. They can not only comprehensively apply relevant knowledge to solve technical problems, but also organize and operate related projects.

Nowadays, the fourth industrial revolution led by intelligent manufacturing is about to erupt in human society, which will revolutionize the human production and life style. In the future, people and machines will get closer and closer, machines will develop into human characteristics, and people will be implanted into the functions of machines. For this reason, many simple and repetitive tasks in human production and life will be completed by machines. In this production mode, innovation will become the norm of production and work, and the workers will change from the operation and execution of the original production tasks to the planners. More work will be done by machines, and the requirements for people are innovative. Sexual analysis and problem-solving ability; from the work content, it will be changed from a process responsible for product production to the entire life cycle of the product. For this reason, workers need to have interdisciplinary ability, master the whole process knowledge of product production, and The quality of the product is loyal and responsible for the whole process; from the perspective of solving the problem, the traditional production mode mainly relies on its own research to solve the problem. In the industrial 4.0 and artificial intelligence mode, the main way to solve the problem is through cloud data and network resources. Support, apply artificial intelligence to solve related problems. The ability requirements of the industry 4.0 and the traditional production mode for skilled personnel are shown in Table 1.

Table 1. Comparison of Industry 4.0 and Traditional Production Mode.

Content	Traditional production mode	Industry 4.0 model	Industry4.0 Capability Requirements
Laborer	Operation, performer	planner	Innovative analytical and problem solving skills
Work content	Responsible for the production and manufacture of a certain process	Responsible for the entire life cycle of product design, manufacturing, management, etc.	Have interdisciplinary ability, master the whole process knowledge of product production; loyalty to quality and full responsibility
Problem solving	Self research	Network, cloud data, artificial intelligence solution	Ability to understand and use artificial intelligence, cloud data, and network height

In the intelligent manufacturing mode, the requirements for the innovation ability of producers are getting higher and higher to meet the individualized needs of consumers; at the same time, they should have more comprehensive knowledge and skills, and can comprehensively apply knowledge to solve the problems related to the whole process of products; The existence of intelligent and cloud data reduces the technical requirements for laborers. Many jobs and positions will realize machine substitution to improve production efficiency. Engineers' professional ability requirements may be reduced and can be compensated by artificial intelligence technology; Artificial intelligence dataizes the skills and experience in the production process, allowing the machine to achieve learning, decision-making, implementation, and so on. The trend of labor capacity changes is shown in Figure 4.

The talents required in the intelligent manufacturing mode should be compound and should have various professional related knowledge, including machinery, control, information, and computers, etc.; at the same time, they have strong innovative analytical and problem-solving abilities. For example, in a smart workshop of thousands of square meters, only a few engineers carry out

maintenance and management. When the workshop is carrying out intelligent and unmanned operation, and the equipment and facilities are running normally, the engineers have basically no need to do the work. However, when there is a problem in the workshop, these engineers should have the ability to deal with various problems.

In the intelligent manufacturing mode, the compounding ability is greatly enhanced. The practitioners are not only responsible for the manufacture of the products, but also bear the entire life cycle of the products, including design, manufacturing, sales, service, etc., therefore requiring the practitioners to have a comprehensive composite ability, for each Links have the ability to analyze and solve problems.

In the smart manufacturing model, the ability to innovate is greatly enhanced. In the intelligent manufacturing mode, there will be more and more intelligent platform products like smart phones. The Internet of Things and intelligence of products will make the functions of products more and more, and innovation will emerge in an endless stream. At the same time, global Collaborative manufacturing and resource sharing make innovation simple and convenient, so innovation will become the main quality requirement for the success of practitioners in the era of intelligent manufacture

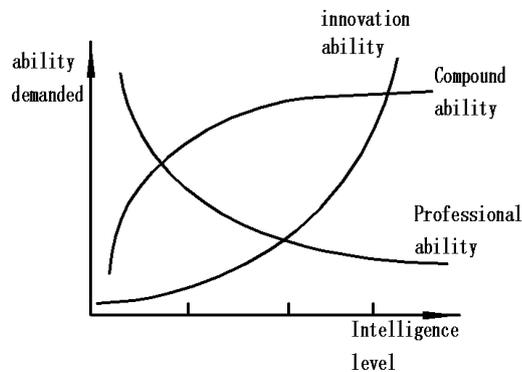


Figure 4. Trends in Talent Characteristics.

5. Technical Skills Training Strategies

With the advent of Industry 4.0 and intelligent manufacturing, the cultivation of relevant technical and technical personnel has become particularly urgent. At present, the main strategy for cultivating technical skills talents under the intelligent manufacturing mode should be to teach students in accordance with their aptitude. It is necessary to train expert talents who have deep research in a certain field, and also need to cultivate a cross-professional “composite” that has deep knowledge of several disciplines. Type talents, as well as “project-based” talents with a holistic view that can lead the development and implementation of complex technologies; innovation capabilities and cloud data processing capabilities will become the basic skills of practitioners.

Since at this stage, it is still in the embryonic stage of intelligent manufacturing, many technologies and fields have not yet reached the level of intelligence. It is necessary to cultivate expert talents who have deep research in a certain field. To this end, it is necessary for the government to lead and concentrate the efforts of all parties to overcome relevant Technical bottlenecks to achieve a true intelligent manufacturing production and life model.

For the training of interdisciplinary talents, vocational colleges should carry out cross-disciplinary construction, carry out professional transformation and upgrading, upgrade the original discipline classification to industry and industry classification; optimize talent training programs, and transform the training room and training equipment. Upgrade; carry out the modern apprenticeship teaching mode, let students enroll in school as employment, build a training model of talent cultivation, evaluation and employment, and realize effective cooperation between the government, schools, enterprises and capital in personnel training to achieve a win-win situation.

Project-based talents refer to the fact that practitioners not only have the skills to complete the project, but also complete the planning, organization and management of the entire project. For the

cultivation of project-based talents, vocational colleges should take project-based teaching as the leading factor to train students' professional action ability; the curriculum implements "action-oriented" teaching methods, allowing students to complete professional, methodological and social skills in the course of professional action. Training.

The cultivation of innovative ability should be carried out throughout the process of training technical personnel. Intelligent manufacturing is actually an innovative production and life model that meets the needs of individualized society. Therefore, everyone needs innovation and innovation can adapt to the development of society.

Cultivation of quality awareness. Technical and technical personnel need to have a strong sense of quality, and must respect the quality, because in the intelligent manufacturing mode, the shortening of the industrial chain requires the practitioner to be responsible for the life cycle of the entire product, and the quality determines the future of the enterprise.

The era of intelligent manufacturing is an information age, requiring practitioners to have the ability to use cloud data to solve problems related to production and life through cloud data.

The cultivation of technical skills is lifelong, three-dimensional, and all-round. Due to the ever-changing technology, practitioners are required to study for the rest of their lives. They not only learn during school, but also need to keep up with the times after work. They must participate in continuing education for a long time. Secondly, talent training is not a unilateral work of vocational colleges. It requires the participation of the whole society. Cultivate students not only to learn knowledge and skills, but more importantly to cultivate their correct outlook on life, values and professionalism; once again, it is necessary to carry out three-dimensional training so that students are both students and employees in the actual work and tasks. Bring them the motivation and pressure to learn, and also train their professional mobility.

6. Summary

The historical experience proves that the equipment manufacturing industry is a country's core competitiveness, and building an internationally competitive manufacturing industry is the only way for China to enhance its comprehensive national strength, safeguard national security, and build a world power. The implementation of the "Made in China 2025" strategy by the state is the need of the times and the inevitable development of history. To this end, under the background of Industry 4.0 and China Manufacturing 2025, the national manufacturing industry is undergoing intensive transformation and upgrading. It is extremely urgent for vocational colleges to train intelligent manufacturing talents, and it is of great significance. This paper introduces the characteristics of production and life under the intelligent manufacturing mode and analyzes the model of technical skills talents. It expounds that intelligent manufacturing is the inevitable development of human society and history. At this stage, the main ability of intelligent manufacturing talents is innovative and complex. And the ability to coordinate; at the same time, think about the strategy of talent cultivation, and propose to teach students in accordance with the current stage of intelligent manufacturing talents, not only to train expert talents who have deep research in a certain field; at the same time, to cultivate a deep understanding of several disciplines. Interdisciplinary talents; also need to cultivate and "comprehensive" talents who have a holistic view and can lead the development and implementation of complex technologies. To complete the training of technical skills talents under intelligent manufacturing, it is necessary to raise awareness and build a system of integration of production and education, school-enterprise cooperation, lifelong, three-dimensional, and all-round talents.

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