

The impact of artificial intelligence technology on the management of front-line employees in manufacturing enterprises: the proposal of a theoretical model

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Abstract. Artificial intelligence technology has greatly changed production process equipment and technological systems. The changes in production technology systems and environments will inevitably affect people's psychological behavior, thereby affecting employee performance. This article found that artificial intelligence technology has the effects of interpersonal isolation, skill deprivation, innovation opportunity deprivation, and sense of achievement deprivation on frontline employees in manufacturing enterprises, leading to a sense of powerlessness and fatigue among frontline employees, resulting in a decrease in employee satisfaction, an increase in turnover rate, and an increase in insecurity. To address the impact of artificial intelligence technology on frontline employees, traditional human resource management models should be changed, employee care should be strengthened, team activities should be emphasized, life situations should be created, and diverse skills should be developed.

1 Introduction

Artificial Intelligence (AI) is a new technological science that studies and develops theories, methods, technologies, and application systems for simulating, extending, and expanding human intelligence^[1]. With the continuous maturity of the theory and technology of artificial intelligence technology, it has increasingly become an important driving force for the new round of technological revolution and industrial transformation, receiving high attention from governments around the world. For example, the Chinese government has continuously introduced policies for the development of the artificial intelligence industry. The application field of artificial intelligence skills is constantly expanding, and automatic and intelligent production facilities are also widely used in the production line of

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manufacturing enterprises. A large number of robots are used in automatic transfer production lines.

The application of artificial intelligence technology in manufacturing enterprises has effectively improved the working environment, replaced low-skilled and repetitive mechanical work, and greatly improved work efficiency. The social technology system school points out that an organization is both a social system and a technological system; The technical system is the intermediary between an organization and the environment, which greatly affects the psychology of employees and thus affects their performance. Unfortunately, people only recognize the impact of artificial intelligence technology on the production environment and efficiency, and rarely see the psychological impact of artificial intelligence technology on front-line employees. This has also led to manufacturing companies improving their work environment, but front-line employees are still difficult to recruit and have a high turnover rate^[2].

This article combines the application of artificial intelligence technology in manufacturing enterprises to preliminary explore the impact of artificial intelligence technology on front-line employees, and then proposes corresponding suggestions for optimizing the management mode of front-line employees.

2 The characteristics and research logic of artificial intelligence technology

2.1 Characteristics of artificial intelligence technology

Artificial intelligence technology is a technology based on computer technology that achieves intelligence by establishing brain and neuron models and simulating human intelligence. The development of comprehensive artificial intelligence technology has the following characteristics.

Intelligence. Whether it is computer school, psychology school or Bionics school, they are all used to explore the secrets of human intelligence and obtain intelligent machines by artificial methods. Therefore, the basic feature of artificial intelligence technology is intelligence. In recent years, the rapid development of big model technology has greatly promoted the "intelligence" of artificial intelligence technology, especially ChatGPT big model technology, which has opened the door to universal artificial intelligence and has high dialogue intention understanding and logical authentication capabilities, enabling self-learning. In many application fields, the use of artificial intelligence technology can perceive human psychological changes, achieving perceptual intelligence and perceptual personification^[3].

Strong learning ability. The development of modern artificial intelligence technology requires high-level algorithms and computing power as support. Modern information network technology connects artificial intelligence computing center nodes distributed in various regions, forming a network that perceives, allocates, and schedules artificial intelligence computing power among multiple computing centers, thereby greatly improving computing power. The enhancement of computing power also enables the implementation of large models, promotes algorithm optimization, and promotes the development of production technology and equipment, such as adaptive neural network control for space flexible robots^[4].

Adaptability. Artificial intelligence can autonomously adjust its application capabilities and intelligence level according to different task requirements and environmental changes. For example, in the medical field, artificial intelligence can autonomously diagnose and treat different conditions and diagnostic needs.

Efficiency. Artificial intelligence can complete a large number of tasks and process a large amount of data in a short period of time. For example, in the financial field, AI can quickly formulate investment strategies and risk control schemes by analyzing Market data and transaction information.

2.2 Development trends of artificial intelligence technology

Since the 1950s, artificial intelligence has developed rapidly and has become increasingly popular and integrated in recent years. Looking ahead to the development of artificial intelligence, there are the following development trends.

Improvement of machine automation and interpretability. At present, many fields have preliminarily realized the design of machine automatic learning process, but its autonomous learning ability is not strong and its interpretability is not strong. For example, the Neural architecture search (NAS) method has reached a relatively high level, but it is still considered as a "black box" in the automation process. Its automation and interpretability still need to be improved.

Artificial intelligence is developing to Cranial nerves computing mode. In various fields, the development of intelligent core chips is very important. Nowadays, intelligent core chips have the ability to surpass the human brain, but compared to the development of artificial intelligence, they are still lagging behind. Nowadays, new technologies are constantly emerging, and artificial intelligence chips still have significant shortcomings compared to the learning ability and scalability of the human brain. In the future, artificial intelligence chips will gradually improve their learning capabilities, break through limitations, and achieve more computing and learning neural computing capabilities.

The widespread integration of artificial intelligence and the Internet of Things. The Internet of Things refers to the technology of connecting various physical devices, sensors, terminals, etc. through a network to achieve information exchange and communication. The Internet of Things can enable us to perceive and control the surrounding environment, improving the convenience and efficiency of life and work. The Internet of Things generates a large amount of data, and artificial intelligence can analyze and process this data to achieve intelligent management and optimization of IoT devices and systems.

In short, in the future, artificial intelligence will gradually become an autonomous system with autonomous decision-making and learning abilities, while also being able to self update and optimize to better adapt to different environments and tasks. At the same time, artificial intelligence will also collaborate more closely with humans, continuously improving their work efficiency and creativity in different fields,

2.3 Research on the impact of artificial intelligence on production line employees

Although artificial intelligence has greatly improved production efficiency, optimized the working environment, and brought great convenience to people, it has also brought impacts and risks to society, causing negative impacts. Jeffrey, the world-renowned godfather of artificial intelligence. Geoffrey Hinton publicly stated that artificial intelligence may pose a danger to humans. From the current research, only a few studies have focused on the impact of artificial intelligence on workers, and there are certain differences. For employment, some studies suggest that the widespread application of robots will cause many existing job positions to face reshuffling and even become redundant. Employees should strive to develop lifelong learning and career transfer abilities^[5]; Some studies have shown that the labor demand of enterprises has significantly increased due to the use of robots, and the employment of traditional industries and low-skilled labor has been suppressed^[6]. For the

impact of artificial intelligence on employees, some believe that it has a significant positive impact on the mental health of manufacturing enterprise employees, especially for workshop workers and post-90s employees^[7]. Research has pointed out that artificial intelligence contributes to labor liberation and enhances human imagination and creativity; Allowing humans to work more freely, making it possible to achieve comprehensive development of human freedom^[8]. Some studies suggest that artificial intelligence strips away human subjectivity and deprives humans of creativity^[9]. Research also shows that for digital employees in the Platform economy, intelligent and subcontracting employment blurs labor relations, which leads to invisible labor management. Digital smart workers not only fail to highlight their labor value, but also fail to protect their rights and interests^[10].

Based on the comprehensive research results, an important reason for the divergence is the lack of a systematic research framework. At the same time, the impact of artificial intelligence varies depending on the target population, and research conclusions naturally differ. From a practical perspective, artificial intelligence has the greatest impact on front-line employees, especially in manufacturing enterprises. Therefore, constructing a theoretical model to conduct research on the impact of artificial intelligence on front-line employees in manufacturing enterprises is beneficial for a more comprehensive understanding of the impact of artificial intelligence and for analyzing the impact of artificial intelligence on different groups.

2.4 Research design

From current research, artificial intelligence has changed people's work environment and reduced their physical labor intensity, but there is also a social deprivation of people. At the same time, the artificial intelligence of production systems in manufacturing enterprises also deprives front-line employees of innovation opportunities. On the basis of existing research literature, this paper further combines the development and practice of artificial intelligence, adopts inductive and deductive reasoning methods, systematically analyzes the impact mechanism of artificial intelligence on front-line employees in manufacturing enterprises, and scientifically constructs a theoretical model. The research Research Route and logic of this paper are shown in Figure 1.

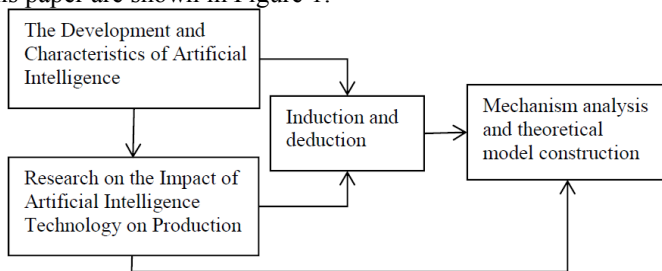


Fig. 1. Research technology road-map and logic diagram.

3 The mechanism and theoretical model construction of the impact of artificial intelligence on front-line employees in manufacturing enterprises

3.1 The impact mechanism of technical systems on employees

After World War II, British scholar E.L. Trist found that many problems lie in that people regard organization as a social system rather than a technological system through long-term

research on production problems [11]; The technological system has a significant impact on the social system, and employee attitudes and group behavior are influenced by the technological system. Therefore, they proposed the theory of social technological systems, emphasizing the organization as a combination of social and technological systems, and the synergy between the two determines the performance of the organization and employees. The changes in the technological system will also cause changes in the social system, and ultimately the social system will adjust to adapt to the technological system.

The social system includes formal organizations, informal organizations, organizational and power structures, cultural and institutional norms, etc. The technical system includes raw materials, machines, processes, and systems that can bring output to the organization. The changes in technological systems have brought about changes in the field, which in turn affect people's physical, psychological, behavioral, as well as the relationships between group members and superiors and subordinates. The adjustment of production settings and equipment, processes and production processes, operating methods, etc. in the technical system will inevitably affect the organization, management and control mode, power relationship, and corresponding institutional norms of the production site. The adjustment of organizational management models, power relationships, and institutional norms on the production front line will further affect the work mode, psychology, and communication methods of employees and group members. The mechanism of the impact of technical systems on employees is shown in Figure 2.

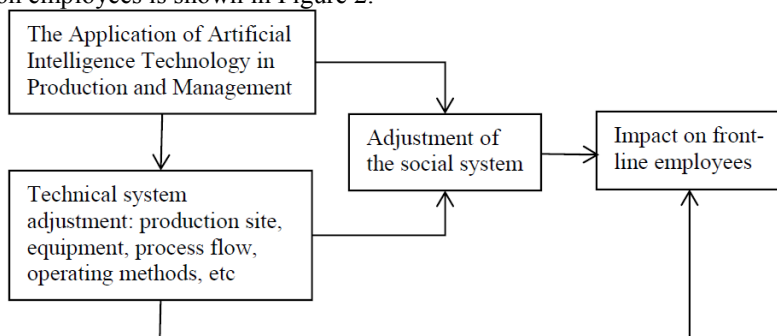


Fig.2. The mechanism of the impact of technical systems on employees.

3.2 A mechanism model for the impact of artificial intelligence technology on front-line employees in manufacturing enterprises

Further analyze the specific impact mechanism by analyzing the impact mechanism of the technical system on employees. The integration of artificial intelligence technology and existing technologies in manufacturing enterprises has shifted production automation and management towards autonomous decision-making by intelligent systems, greatly optimizing the working environment. The automation of the production system has greatly reduced the number of on-site employees, while also causing the existing skills and value of employees to lose their effectiveness, resulting in a sense of skill deprivation [12]. At the same time, highly intelligent production facilities transform front-line employees into part of intelligent systems, and their work is constrained by the operation of intelligent systems. The highly automated and intelligent production system has greatly reduced the number of front-line employees, and interpersonal communication between employees has been cut off by technical systems, reducing human sociality. In addition, with the application of artificial intelligence, production systems have become more integrated, and the impact of people on the system has become smaller. The need for front-line employees to innovate and create has also been greatly reduced, and traditional management models such as

quality management teams and cost teams are no longer effective. This also damages the subjectivity of employees and makes it difficult to meet their achievement motivation. At the same time, production is completely dominated by intelligent systems, and front-line employees are dependent on them, which also leads to a sense of powerlessness among employees.

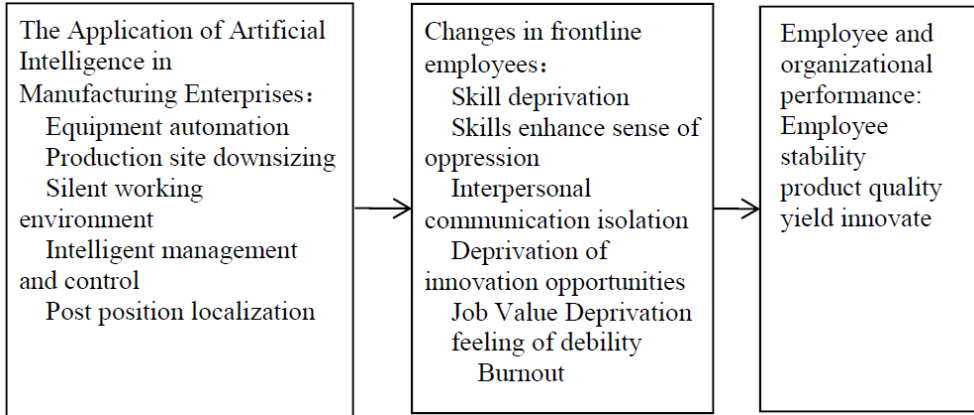


Fig. 3. Theoretical model of the mechanism of artificial intelligence on frontline employees.

4 Optimization of front-line employee management mode in manufacturing enterprises to adapt to the era of artificial intelligence

To reduce the negative impact of artificial intelligence on front-line employees in manufacturing enterprises, based on the theoretical model in Figure 2, it is recommended to optimize the management mode of front-line employees in manufacturing enterprises as follows.

Innovate employee relationship management models, strengthen employee humanistic care, and alleviate the social deprivation of front-line employees by artificial intelligence. In response to the lack of interpersonal communication among front-line employees, manufacturing enterprises should strengthen the creation of interpersonal communication environments, innovate and develop enterprise interpersonal communication channels, build collective cultural and entertainment facilities, and strengthen communication and cooperation among employees through group building activities.

Strengthen the cultivation of employees' employability and learning spirit. Employability is an individual's ability to obtain and maintain employment. Manufacturing enterprises should strengthen the cultivation of career planning awareness among front-line employees, drive their learning of professional skills through career planning, and respond to the challenges of career development. At the same time, manufacturing enterprises should strengthen the construction of organizational learning atmosphere and actively carry out the construction of learning organizations, in order to drive the learning and growth of front-line employees.

Establish and develop democratic Management style and model of enterprises, and expand the participation channels of front-line employees. Manufacturing enterprises should expand the channels and contents for front-line employees to participate in management, establish a democratic and participatory Management style for managers at all levels, and eliminate barriers to communication between employees and managers.

Innovate employees' work value experience and enhance their sense of achievement. Manufacturing enterprises should create channels and opportunities for front-line

employees to communicate with customers, receive feedback on products or services, and enhance their sense of achievement.

5 Conclusion and prospects

In this paper, the social technology system theory is used to conduct a Exploratory research on the influence mechanism of artificial intelligence. Artificial intelligence first affects the social system and then affects front-line employees in manufacturing enterprises; The second is to have an impact on the social system and front-line employees through integration with the technical system. The impact of artificial intelligence on front-line employees in manufacturing enterprises is manifested in skill deprivation, innovation opportunity deprivation, interpersonal communication isolation, and a sense of powerlessness, ultimately leading to a loss of achievement, a decrease in work value, and a decrease in stability for front-line employees. Therefore, for front-line employees, manufacturing enterprises should attach great importance to humanistic care, focus on team building work, create interpersonal communication channels within the organization, and strengthen the cultivation of employees' employ-ability.

This article analyzes the mechanism of artificial intelligence on front-line employees based on the theory of social technology systems, constructs a theoretical model of the impact of artificial intelligence on front-line employees, and completes the theoretical framework. To more scientifically measure the impact of artificial intelligence on front-line employees in manufacturing enterprises, it is necessary to design measurement scales based on theoretical models, conduct questionnaire surveys, and conduct empirical analysis.

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