



Analysis of the Current Situation of Mechanical Engineering Management

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Abstract. The application of mechanical engineering management is a management method and strategy adopted to effectively coordinate and control mechanical engineering project activities. The current research and practice have made some progress in this field. Research has shown that the complexity of mechanical engineering projects, the fiercely competitive market environment, the rapid development of technology, and the demand for sustainable development are the main driving forces behind the research and application of mechanical engineering management. However, existing research has some shortcomings, including a lack of empirical research and data analysis, a lack of practical cases and application validation, imbalanced research on enterprises of different sizes and industries, and a neglect of the importance of human resource management. Therefore, based on existing research, this article comprehensively considers technology, processes, and human resource management to promote the further development and improvement of mechanical engineering management applications. Starting from the current research status and based on modern mechanical management models, this article analyzes the problems in the current research status of mechanical management and conducts a detailed analysis to identify the reasons and corresponding strategies. This study will be beneficial for the future development of mechanical engineering enterprises and promote industry standardization.

Keywords: Mechanical engineering; Management; status

1 Introduction

1.1 Background

In today's globalized and fiercely competitive market environment, mechanical engineering enterprises are facing increasing market pressure. Effective management methods can help enterprises improve efficiency, reduce costs, improve product quality, and quickly respond to market demands, thereby gaining competitive advantages. Meanwhile, mechanical engineering projects typically have complex technical requirements, multiple participants, and strict time and budget constraints. To ensure the successful delivery of the project, effective management methods and

strategies are needed to coordinate and control various project activities. In addition, with the continuous progress of technology, various new technologies and tools have emerged in the field of mechanical engineering, such as advanced manufacturing technology, digital design and manufacturing, automation and robotics technology, etc. The application of these new technologies has brought new opportunities and challenges to mechanical engineering management, and researchers need to deeply explore how to effectively apply and integrate these technologies.

In summary, the research background of mechanical engineering management applications includes project complexity, a fiercely competitive market environment, and rapid technological development.

1.2 Related Research

Mechanical equipment is a necessary tool in the production process of enterprises. Good, stable, and safe operation is conducive to the production activities of enterprises and ultimately helps them profit. On the contrary, once mechanical equipment problems occur, maintenance, scrapping, and accidents may bring huge losses to the enterprise and affect production. In order for mechanical equipment to work in an ideal state, it is necessary to scientifically maintain and manage the equipment. Numerous scholars have conducted research in this field.

Smith, J. analyzed the application status of project management techniques in the mechanical engineering field and discussed the application of Critical path method (CPM), Earned value management (EVM) and agile project management in mechanical engineering project management [1]. He discussed the effectiveness and application challenges of these technologies and emphasized new trends in project management practices. Brown, R. focuses on the application of lean manufacturing principles to mechanical engineering management in their own book, discussing the implementation of lean practices such as value stream mapping, identification systems, and continuous improvement to improve operational efficiency and reduce waste in mechanical engineering processes. Through case analysis and industry case analysis, successful cases of the application of lean principles were highlighted, and suggestions for further improvement were proposed [2]. Sharma, S. studied the application of risk management strategies in mechanical engineering projects. Discussed methods for identifying, evaluating, and mitigating risks in various aspects of mechanical engineering, including design, manufacturing, and installation. He summarized and analyzed the effectiveness of risk management techniques such as failure mode and impact analysis (FMEA) and Fault tree analysis (FTA) to ensure the success of the project and put forward suggestions for optimizing risk management practices [3]. Lee, C analyzed the application of sustainable practices in mechanical and electrical engineering management. Exploring the integration of sustainable design principles, energy-saving technologies, and environmentally friendly materials in mechanical engineering projects, reviewing and discussing the benefits and challenges of implementing sustainable practices, and emphasizing successful cases where sustainability has a positive impact in the field of mechanical engineering [4]. Wang emphasized the application of information technology in the management of

construction machinery in his book. This paper have studied how advanced tools and software can improve project management efficiency, data analysis, and decision support. This book explores the application cases and achievements of information technology in mechanical engineering management and proposes suggestions for further development [5].

Most of the current research focuses on introducing and exploring different management theories, methods, and tools, but lacks in-depth research in practical applications. There is a lack of empirical research on how these theories and methods are applied in practical mechanical engineering projects. At the same time, the importance of human resource management was overlooked. In mechanical engineering projects, effective teamwork and personnel management are crucial for project success. Therefore, it is necessary to delve deeper into the application of human resource management in mechanical engineering management.

1.3 Objection

This paper provides a comprehensive understanding of the practical application of mechanical engineering management through a literature review and field research, including application fields, main methods and tools, and application effects. By evaluating and analyzing existing applications, identify the main challenges and issues faced by mechanical engineering management applications, such as project planning and control, resource management, risk management, and other challenges. TO analyze existing problems and challenges, and explore the application prospects of new technologies, effective improvement strategies are provided to improve the efficiency and quality of mechanical engineering management.

2 Development Direction of Modern Mechanical Management Mode

With the continuous development of the market economy, market competition between enterprises is becoming increasingly fierce. The management of production machinery has a significant impact on enterprise production. When the management mode of production machinery is outdated, the management level is not high and the production efficiency is very low. Not only does it delay the production time of the enterprise, but it also affects the product quality, which is fatal for the enterprise, losing competitiveness, and even going bankrupt. How to improve the mechanical management mode, increase the utilization rate of production machinery, and ensuring production quality has become an important issue for production enterprises.

2.1 Development Direction

Digital Transformation. With the rapid development of information technology, the application of Digital transformation in the field of machinery management is

increasingly popular. Modern mechanical management models tend to adopt advanced software, sensors, and data analysis technologies to achieve real-time monitoring, analysis, and prediction of production data, thereby improving production efficiency, quality control, and resource utilization.

Intelligence and Automation. Intelligence and automation are important directions in modern mechanical management. By introducing robot technology, automation equipment, and intelligent manufacturing systems, the automation and intelligence of the production process can be achieved, reducing manual intervention, improving production efficiency and quality, and reducing labor costs [6].

Lean Manufacturing and Continuous Improvement. Lean manufacturing is a management concept and method, which aims to achieve continuous improvement by eliminating waste, and improving process efficiency and quality. Modern machinery management mode will pay more and more attention to the application of Lean manufacturing, and achieve higher efficiency and quality level by improving production processes, optimizing resource utilization and cultivating employee participation.

Green and Sustainable Development. Green and sustainable development is an important issue of global concern, which also puts forward new requirements for machinery management [7]. Modern mechanical management models will increasingly focus on environmental protection and sustainable resource utilization, promoting the application of measures such as green manufacturing, energy conservation, and waste management to reduce their impact on the environment.

Cross-Departmental Collaboration and Supply Chain Integration. Modern mechanical management is no longer limited to a single enterprise but emphasizes cross-departmental collaboration and supply chain integration. The mechanical management model will pay more attention to supplier selection and management, logistics optimization, and information sharing to improve the efficiency and reliability of the entire supply chain.

Data-driven decision-making and predictive analysis. Modern mechanical management models will increasingly rely on data-driven decision-making and predictive analysis. By collecting, analyzing and mining Big data, This paper can better understand the status and potential problems in the production process, make accurate decisions and forecasts, and improve the scientific and accuracy of management decisions.

Overall, modern mechanical management models will tend to be digital, intelligent, lean, sustainable, and collaborative to adapt to rapidly changing market demands and technological development, and improve production efficiency, quality, and sustainable development levels.

2.2 Development Model

Applying the Project Approach. The concept of project-based production was proposed at a production enterprise seminar organized by the Yinchuan National Planning Commission in 1985. It is a product of the combination of China's production system reform practice and international project management experience. It is a specific application of China's international production management practice and the crystallization of the collective wisdom of police departments, theoretical departments, and practical departments in this field [8]. This design method has two main characteristics. Firstly, the separation of the management and working class within the production enterprise is also known as two-level separation. Secondly, the cost objectives of the project management team are clearer and more responsible.

Common Mechanical Management Methods. Firstly, fixed management. Fixed management of mechanical equipment is a widely adopted management model in many enterprises. This management mode can better maintain the machine, avoid excessive use of the machine, and improve the service life of the machine. However, mechanical equipment is an important tool for enterprise production. Only by improving the efficiency of machine use can This paper improve the operational efficiency of enterprises and create greater economic benefits for them.

Secondly, lease management. Mechanical equipment leasing management is a very flexible management method that can maximize the utilization of mechanical equipment, reduce costs, and increase profits [9]. The specific approach is for the company to incorporate its own mechanical equipment into the leasing company for comprehensive management, in order to better utilize it and to bear a certain amount of equipment leasing costs when other companies use the equipment. Not only does it reduce the idle use of company equipment, but it also increases the company's economic profits.

2.3 Comprehensive Management

In fact, traditional management is not completely backward, and traditional management also has advantages. For example, traditional management ensures the stability and effective operation of mechanical equipment, but many management models cannot guarantee it. Therefore, comprehensive management is very important, combining the advantages of traditional and modern management to ensure the coordinated development of maintenance, repair, and operation of mechanical equipment, achieve the reasonable operation of mechanical equipment, and improve efficiency [10]. A high level of mechanical equipment management in a company can greatly improve its economic benefits. It can be said that the comprehensive management model is the development direction of future mechanical equipment management.

3 Shortcomings in Mechanical Engineering Management

Mechanical equipment is an important tool for enterprise production, which is self-evident for the development and survival of enterprises. Mechanical equipment has high costs, large volumes, and complex replacement and maintenance work. Once problems occur, it greatly affects the production efficiency of enterprises [11]. Therefore, equipment management in enterprises is an important component of enterprise management and should be taken seriously. Through scientific and effective management of mechanical equipment, it can effectively reduce the occurrence rate of faults, eliminate hidden dangers, and extend the service life of equipment, which has a profound impact on the economic benefits and development of enterprises.

3.1 Imperfect Mechanical Control System and Insufficient Strict Implementation of Rules and Regulations

Currently, China's machinery manufacturing management is facing a chaotic situation. Many enterprises fail to fully attach importance to mechanical engineering management and place too much emphasis on economic benefits, resulting in mechanical equipment being in working condition for a long time and lacking a complete control system. This has brought increasing difficulties to the accounting of fixed assets for enterprises and has shown incomplete problems in the management and regulatory system of China's machinery manufacturing industry. The domestic mechanical equipment management department has not yet established a complete equipment technical archive and daily workstations, which is difficult to meet the actual needs of enterprises. In addition, due to improper use and lack of supervision of mechanical equipment, the equipment cannot work in a timely manner or is damaged, which increases maintenance costs and reduces the economic benefits of the enterprise, which is detrimental to normal production.

3.2 Lack of Understanding Among Mechanical Equipment Experts and Management Personnel

This is the main issue in mechanical engineering management. Mechanical engineering has the characteristics of frequent use and a large number of participants, but the leadership and management of most enterprises have not fully attached importance to mechanized management. One of the main problems is that enterprises strictly control the number of mechanical engineering management personnel to reduce human resource costs and increase economic profits, leading to a serious shortage of mechanical engineering management professionals. In addition, due to the management skills of part-time employees being unable to meet the requirements of mechanical engineering management, the management work is relatively chaotic, directly affecting the mechanical control system[12]. Overall, enterprises lack a comprehensive mechanical engineering management system and professional management talents. Mechanical engineering management is often non-standard,

lacking strict mechanical warehouses and mechanical management systems, resulting in limited disposal of mechanical use, maintenance, upkeep, and operation, leading to chaotic mechanical management. In addition, many enterprises have no understanding of the type and quantity of equipment, and their management knowledge is very weak.

3.3 Improper Maintenance of Mechanical Equipment

At present, the key to comprehensive management of production enterprises is to regularly repair and maintain mechanical equipment. However, the maintenance work of mechanical equipment in China has performed poorly in the following aspects: firstly, there is insufficient investment in funds. Some machine operators realize the importance of maintaining machines and equipment, but in order to save the company's economic expenses, they have extended maintenance time. This concept and practice can cause serious damage to machines and equipment, leading to many machines and equipment being scrapped before the specified deadline. This goes against the original intention of maintenance. Secondly, over time, maintenance techniques lag behind. In the information age, mechanical equipment is also constantly being updated, and traditional mechanical equipment maintenance techniques in the past are difficult to keep up with the development of the times. Backward maintenance techniques often lead to poor and improper maintenance of mechanical equipment, seriously damaging the structure of the equipment. Thirdly, the supervision of mechanical equipment maintenance is not strict. Due to the long maintenance time of mechanical equipment, many supervisors and equipment management personnel lack patience and meticulousness in their work, resulting in the failure to do a good job in mechanical equipment maintenance, seriously affecting the safety and stability of mechanical equipment.

3.4 Delayed Updates of Mechanical Equipment, Severe Aging, and Low Operating Efficiency

Another important issue in mechanical engineering management is the untimely updating of mechanical equipment and the serious aging of mechanical equipment. This is because the business department and financial budget department of the enterprise lacks effective communication and correct mechanical equipment management concepts. At the same time, mechanical equipment with high procurement costs, high construction costs, and long maintenance times will have a certain impact on the cash flow and economic income of the enterprise. When managing new mechanical equipment, mechanical equipment management personnel often adopt a conservative approach and do not choose to update existing mechanical equipment. Delayed updates of mechanical equipment may lead to breach of contract risks, such as extended contract performance time, increased construction period of new projects, etc., which can lead to vicious production and operation of enterprises.

4 Measures to Strengthen Mechanical Engineering Management

4.1 Cultivate Employees' Sense of Responsibility

Mechanical management is a very complex task. Mechanical management personnel must develop a scientific, reasonable, and comprehensive work plan to supervise and manage the entire mechanical management process. To achieve this, business leaders must have a high sense of responsibility. Therefore, enterprises should encourage machine operators to develop reasonable machine management plans based on actual production needs to ensure that machine management can meet the production needs of the enterprise. In addition, it is necessary for management personnel to regularly inspect the operation of mechanical equipment and fully demonstrate its actual effectiveness.

4.2 Strengthen the Improvement of Mechanical Engineering Management System and Improve Execution Ability

In order to solve the problem of inadequate mechanical engineering management systems and insufficient execution in many enterprises in China, enterprise leaders and management should change their thinking mode, focus on improving the machine management system, and fundamentally improve the overall mechanism of the enterprise. At the same time, enterprises that manage the use of mechanical equipment should understand the working characteristics and performance of their existing mechanical equipment, and consider their use based on the development needs and strategies of the enterprise [13]. Adjusting the current mechanical equipment management system to make the requirements for mechanical equipment in daily production more reasonable requires the development of clear and detailed mechanical equipment management manuals.

4.3 Establish a Responsibility System for The Operation of Relevant Mechanical Equipment

It is also necessary to establish a mechanical engineering responsibility system. The system must clarify the specific content and responsibilities of each employee's work. If everyone can unleash their potential, mechanized and institutionalized management of construction projects can be achieved.

4.4 Regular Maintenance of Mechanical Equipment

During the normal operation of machinery, regular maintenance should be carried out to promptly identify mechanical equipment problems, take preventive measures, and control accidents at an early stage. Mechanical equipment failures are mainly caused by maintenance negligence, which directly affects the overall quality and construction

safety of the project. In addition, if there is maintenance work, it is also related to the degree and frequency of machine maintenance. Therefore, supervisory and management personnel of enterprises should closely monitor this issue and establish relevant maintenance systems to maintain and effectively operate machines. Single-stage mechanical equipment must undergo regular multi-level maintenance to ensure that it is in good working condition and extend its service life. Maintenance should follow the principle of putting prevention first and establish a sound regular maintenance system. In actual maintenance and upkeep, the construction and wear of mechanical equipment, as well as its usage conditions and guidelines, should strictly follow the regular maintenance and upkeep of mechanical equipment. Whether it is multi-level maintenance or single-level maintenance, integrity and organization must be ensured, and maintenance plans must be strictly executed in accordance with maintenance and maintenance guidelines.

4.5 Establish a Mechanical Management Evaluation Mechanism to Improve Usage Efficiency

Firstly, the company should continuously train high-quality machine operators for daily maintenance to reduce the occurrence of machine and equipment accidents. Secondly, establish a sound accountability system to supervise the storage, transfer, maintenance, and other operations of machinery in real time, ensuring the accuracy of its use. Fully utilize incentive measures to reward employees who perform well in maintenance work, and correspondingly punish employees who do not perform well in their work. In addition, it is necessary to develop a machine management assessment mechanism based on the actual situation of the enterprise, in order to improve the efficiency of the use of enterprise machinery and equipment.

4.6 Continuously Optimizing Processes to Achieve Fully Automated and High-Quality Production Process Management

Due to the analysis of the overall development of mechanical design and production automation in China's manufacturing industry, industrial automation cannot be fully realized. Therefore, China's mechanical design and automation product production technology cannot be fully applied. Therefore, in order to achieve the healthy development of mechanical design and production automation in China, enterprises must continuously innovate, optimize, and improve technology while achieving full process automation. By adopting a high-quality production management model, This paper can improve the efficiency of production management and enhance the economic benefits of the enterprise.

4.7 Strengthen Personnel Training

Users of construction machinery and equipment must continuously increase investment, combine existing construction machinery and equipment with maintenance techniques, and arrange for dedicated personnel to provide regular or

irregular guidance and training to workers. At the same time, corresponding training and assessment work should be carried out to ensure the effectiveness of the training. In specific practice, the focus is on organizing machine repair personnel, organizing technical competitions, developing interesting reward and punishment measures, and stimulating employee enthusiasm. The personnel responsible for the maintenance of construction machinery and equipment must have a strong spirit of innovation, actively study new methods, strengthen the computerized maintenance management system of equipment, and control the cost of fault maintenance. It is worth noting that increasing user training enables them to master how to use it correctly. When using mechanical equipment, the following points must be checked: start the engine according to scientific and reasonable steps. Try to avoid mechanical equipment overload as the motor cannot be started according to the correct procedure. At the same time, in order to reduce the occurrence of mechanical equipment failures, the focus should be on optimizing the operating environment of mechanical equipment, such as leveling the operating site, reducing the occurrence of mechanical equipment tilting, and ensuring that the mechanical equipment is in a stable state.

4.8 Implement a Flexible Machine Maintenance System to Ensure the Operation of the Machinery

Mechanical maintenance is the central link of production or construction, and a good mechanical maintenance system is the key to the overall progress and efficiency of the project. Therefore, in order to ensure the good operation of machinery, it is necessary to further improve the maintenance system of the machine, introduce a flexible service system, and strictly execute it regularly. Under the influence of various processes, complex machines, factors, etc., mechanical management work is becoming increasingly complex, and mechanical management is the key to mechanical operation. Therefore, it is necessary to design a machine maintenance system suitable for the actual situation of the enterprise or construction unit based on the characteristics of the enterprise, establish a responsibility system, and implement the management and maintenance of operating machines. At the same time, the maintenance and upkeep of machinery should be registered in a timely manner to provide a reliable basis for subsequent management, which is also key evidence of responsibility.

4.9 The Management Process of Mechanical Manufacturing Enterprises Must Be Intelligent

Intelligent management is an important concept in current mechanical engineering management, which is of great significance for the management of mechanical engineering enterprises. By using intelligent systems to inspect the production and sales activities of mechanical manufacturing enterprises, and actively tracking and adjusting experimental results, the timeliness and effectiveness of enterprise management as well as the transparency of management information are ensured, reducing the adverse impact of human factors on human resource management.

There are several measures in the following aspects: 1. Through data collection and analysis, convert mechanical equipment operation data, fault data, etc. into valuable information for making decisions and optimizing operation and maintenance strategies. Machine learning and data mining technologies can be used to establish prediction models, realize fault warning and Preventive maintenance, and improve the reliability and efficiency of mechanical equipment. 2. Utilize the Internet of Things and remote monitoring technology to achieve real-time monitoring and remote control of mechanical equipment. By connecting sensors and networks, collect data on equipment operation status, temperature, pressure, etc., promptly identify problems and provide remote intervention to reduce maintenance time and costs. 3. Adopting technologies such as automation equipment and intelligent robots to achieve automated production of mechanical engineering. For example, using robots for material handling, welding, assembly, and other tasks can improve production efficiency and quality stability. 4. Use virtual simulation technology to establish a digital twin model of mechanical equipment, and conduct virtual testing, optimization, and predictive analysis of the equipment. Equipment parameter adjustment, fault simulation, etc. can be carried out in a virtual environment to reduce the cost and risk of actual testing and maintenance. These measures can help improve the management efficiency and production efficiency of mechanical engineering, and achieve intelligent and efficient mechanical engineering management.

5 Conclusion

Mechanical engineering is a field that continuously improves its professional level. However, despite this, many enterprises in China still face a series of urgent problems in mechanical manufacturing management. Traditional management concepts and models are outdated and unable to adapt to rapidly changing market demands; At the same time, the lack of technological innovation awareness and ability makes it difficult for enterprises to keep up with the pace of technological progress. There are also a series of problems in quality management, including lax quality monitoring, high rate of Product defect and inadequate after-sales service. These issues directly affect the competitiveness and sustainable development ability of enterprises.

Therefore, the research objective of this article is to seek to improve the efficiency, quality, and sustainability of mechanical engineering projects and manufacturing processes to meet the growing market demand and challenges. In order to achieve this goal, enterprises should attach great importance to mechanical engineering management and establish corresponding mechanical management evaluation mechanisms. This evaluation mechanism can help enterprises comprehensively understand the usage of mechanical equipment, timely identify existing problems, and take corresponding measures to improve. In addition, enterprises also need to improve the efficiency of using mechanical equipment, avoid resource waste, reduce production costs, and enhance their competitiveness.

In addition, improving the mechanical management system is also crucial. This includes optimizing the maintenance and upkeep plan of mechanical equipment to

ensure long-term stable operation of the equipment. At the same time, establish a scientific mechanism for equipment update and replacement, timely eliminate outdated equipment, introduce advanced technology and equipment, and maintain the technological competitive advantage of the enterprise.

In terms of project implementation, enterprises need to strengthen project management, improve project progress and quality. This involves reasonable project planning, effective resource allocation, and efficient team collaboration. Through effective project management, enterprises can timely identify and solve problems, ensure timely completion of projects, and ensure the quality of project delivery. Ultimately, through these efforts, enterprises can provide favorable conditions for their sustainable development. Improving the level of mechanical engineering management will help enterprises stand out in fierce market competition, achieve stable growth, and respond to future challenges. Only by continuously strengthening mechanical engineering management, adapting to the changes of the times and technological progress, can enterprises achieve greater success in sustainable development.

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