Research Article

Problems and Countermeasures of Coal Mine Engineering Management under the Background of Big Data and IoT

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In the context of the era of big data and the Internet of Things, there are certain engineering management problems in the development of my country’s coal mine enterprise engineering management. Based on the research content of domestic coal enterprises in the construction and engineering management of production and engineering, comprehensive research and analysis of problems at different stages of different stages, optimizing the improvement of coal mine engineering management levels, were done. In the process of various factors that affect the safety of coal mine safety production and the high-quality development of enterprises, this article focuses on the problems and hidden dangers affecting the management of coal mine engineering management and focuses on improving measures to improve the safety of coal mines and improve corporate safety benefits. After conducting research, an evaluation and analysis model, a comprehensive research on the various factors that affect the safety of coal mine, conducted a comprehensive research and conducted research on factors and measures affecting engineering management. A comprehensive data analysis model and factor management model based on coal mine engineering management are constructed. In the context of big data and the Internet of Things, targeted evaluation and analysis based on different security risks and engineering management issues were proposed with feasible opinions and measures.

1. Introduction

In recent years, the domestic economic environment has been optimized, and the demand for coal energy has gradually expanded. However, with the continuous optimization of the production management of energy enterprises and the continuous improvement of management quality, certain problems have also been exposed in the process of engineering management. Affected by the national macrocontrol and various factors of the outside world, there are certain engineering management issues in the balance management and economic benefits of coal mine companies. This article conducts comprehensive investigations and analysis of such problems and conducts comprehensive research on these issues directly or indirectly factors, formulates feasible measures and means to effectively promote national economic development, improves the economic benefits of coal enterprises, and greatly benefits coal enterprises. Improving energy utilization has certain reference significance. For coal mine companies, the improvement of the engineering management system can effectively improve the level of security management. A comprehensive engineering management system can effectively improve the overall benefits of the enterprise, the reasonable development of coal resources, and the steady growth of economic benefits, providing a safe and stable energy supply for national economic development, and providing safe and stable energy supply is the basis of economic development. In the process of promoting the smooth and rapid development of the national economy and society, the level of engineering management of coal mine enterprises directly or indirectly affects the benefits and costs of domestic enterprises [1, 2]. On the basis of ensuring safety, effectively improving the efficiency of coal mine enterprises is an important symbol of improving the level of engineering management. In the context of ensuring quality, shortening construction periods, and reducing resource consumption, the steady improvement of engineering management level is an important research topic facing coal mine companies.
2. The Current Status of Engineering Management of Coal Mine Enterprises

2.1. In the Background of Big Data, the Development Direction of the Engineering Management of Coal Mine Enterprises. In the context of the Internet of Things and big data technology, the engineering management of coal mine companies is facing a new development model and challenge. With the management of big data technology for coal mining engineering, it brings wider data resources, and at the same time, it provides an important theoretical foundation and data support for the improvement of engineering management measures. In order to effectively improve the level of engineering management of coal mine enterprises, the state and government departments have introduced corresponding regulations, systems, and technical standards and provided a certain reference and reference for engineering management of coal mine enterprises. However, in the actual engineering management process, it is facing the influence and restrictions from many aspects such as the management of coal mine engineering itself and the outside world, which brings a series of problems and contradictions in safety. To help coal mine companies, finding more stable balance points in the process of safety production and economic benefits is needed. In the process of promoting the improvement of the project management process of coal mine enterprises, through strengthening the grassroots management, time management, cost management, and human resource management of coal mine enterprises, we can develop corresponding institutional measures more comprehensively. In a comprehensive system tracking environment, through effective institutional constraints and process management, it has achieved steady improvement of the safety production and economic benefits of coal mines. In the new process management process of coal mine enterprises, the construction of a more complete coal mine enterprise engineering management system can provide a steady stream of motivation for the development of enterprises [3, 4]. However, in the process of real development, the factors and deficiencies of major coal mine enterprises have not been in place, the quality of engineering management is poor, and the disorders of grass-roots project management disorders still exist. Therefore, in the context of big data and the Internet of Things, how to improve the quality of the management of coal mine enterprise projects more perfectly is the main contradiction and problem at this stage.

2.2. The Development Driving Force Brought by the Internet of Things to the Engineering Management of Coal Mine Enterprises. Entering the 21st century, the rapid development of the Internet has brought new ways to transactions to natural resources such as coal, promoting the transaction methods and methods of natural resources such as coal more diverse. Convenient trading methods promote coal mine companies to face huge pressure and challenges in terms of safety production and improvement of economic benefits. Therefore, in the context of the Internet, promoting the excellent transformation of engineering management of coal mine enterprises is important to promote and drive the comprehensive construction of coal mine enterprise engineering management. In the process of coal transaction under the condition of IoT, in the process of coal transaction under the condition of the Internet of Things, the optimization of the management mode and process management mode and process management model of the project has been more clearly proposed. Relying on the construction of coal mining engineering project management, the management decision-making method has enabled some coal mine companies to promote the construction of the entire engineering project with more feasible technical solutions in economic construction and efficiency construction. At the same time, for the management of specific coal mine engineering projects, we must implement a more refined engineering project management model, to promote the improvement of engineering management quality with more comprehensive engineering project management methods [5, 6]. However, in the process of engineering management, the Internet of Things has also brought new challenges to coal mine companies, such as a series of challenges in terms of engineering cost, engineering management, and engineering quality. Especially in the context of the Internet, how to better achieve the optimization and distribution of resources in coal mine companies and improving the economic benefits of enterprises still have huge challenges. In Figure 1, the number of domestic coal mine accidents from 2005 to 2021 is shown in the situation.

3. The Characteristics of Engineering Management and Existing Problems

3.1. Features of Engineering Management of Coal Mine Enterprises

3.1.1. The Factors of Engineering Management of Coal Mine Enterprises Are Diverse. For the engineering project management of coal mine companies, its construction time span is long and there are many factors. And in the process of engineering project management, it can cover different regions, time, and artificial factors. These factors have different effects on the improvement of the long-term management and management methods of online companies. During the long-term engineering construction management process, different regional characteristics, in the development of coal mine enterprises, play a different role. At different stages, it will also be affected by international coal prices. The overall economic benefits of the enterprise and the influence of fluctuations are greater. As a result, it is affected by the price and economic benefits in the process of engineering project management. The implementation of the management model and method is restricted.

3.1.2. Coal Mine Enterprise Engineering Management Process Is Complicated. During the engineering management process of coal mine companies, it covers a relatively complicated management process, including the process management of coal mine companies in initial bidding, construction, development, planning, and later improvement and further optimization. In the entire engineering management
management stages, in different methods and refined management measures, in different management stages, in different management processes and methods, the engineering management of coal mine enterprises plays an important constraint and influence [7, 8].

3.1.3. Engineering Management of Coal Mine Enterprises Is High. Safety production of coal mine enterprises has always been the country and enterprises for a long time, the most concerned and concern for production indicators. A coal mine enterprise safety production is an important indicator and factors for enterprises to implement economic activities normally. Therefore, through a more comprehensive engineering management plan, it lays a more solid foundation for the safety production of coal mine companies and lays a more solid foundation in order to promote the establishment of a more optimized and efficient management system in the process of safety management, laying a solid foundation for the safety of coal mine enterprises. In the long-term construction and development process of coal mine companies, a complete set of adjustable and executable coal mine engineering management implementation plans are important magic weapons to promote the long-term construction of enterprises and improve economic benefits [9, 10].

3.2. The Problems and Shortcomings of the Management of the Engineering Management of the Coal Mine Enterprise

3.2.1. Engineering Project Management Personnel Quality and Quality Levels Are Uneven. Coal mine companies are not perfect in the training and training methods of engineering management talents, and they pay insufficient attention to the talents of engineering management. During the implementation of the entire engineering management, it is necessary to have a complete set of talent management mechanisms, supporting the corresponding reward mechanism and talent training system. However, in different sizes of coal mine companies, the management and training of talents are still uneven. In terms of engineering management talent training, large-scale state-owned enterprise coal enterprises in China attach great importance to the training of talents and have established a relatively complete talent management system. However, in individual coal mine companies and small coal mine companies, the improvement of the training system and measures for engineering management talents is not enough. Therefore, in the development of these coal mine companies, the local safety production hazards occurred, which leads to regional safety rectification problems, which leads to an uneven distribution of regional engineering managers and affects the long-term construction and development of the regional economy. In addition, some coal mine companies have not undergone professional skills training and lack of safety production awareness in the selection of engineering management talents. Some engineering managers have not experienced basic training for front-line safety production, and they do not have certain work experience. For the entire project, the entire project is the entire project. The promotion and plan formulation of the management model, lack of basic cognition, and formal plans and measures are not feasible [11, 12]. In the selection of personnel flow and engineering project technical personnel, a more complete system must be established. State and major universities must attach importance to the training and training of engineering management talents, establish a sound training mechanism, and promote talent construction and talent long-term development of the team. In Figure 2, the survey results of engineering management issues are summarized, as shown below.

3.2.2. During the Project Management Process, the Safety Awareness Is Not Strong. The production and operation activities of coal mine enterprises are based on a safety system guarantee and safety basis. Only under production and operation activities can effectively promote and promote the steady improvement of the economic benefits of the enterprise under the framework of safety guarantee. To build a complete set of engineering management plans and measures, it needs to be established on the basis of safety. By constructing a more comprehensive engineering management system, with the important prerequisites of safety awareness, the orderly construction and implementation of engineering management projects are promoted. At the same time, during the training of engineering management talents, we must pay attention to the cultivation and shaping of safety awareness. From the fundamental terms of the construction of engineering management talents, build a more complete awareness of safety awareness of engineering management talents. During the entire engineering management process, the construction of talents is based on a good safety awareness, promoting the implementation of engineering management plans, and can promote the effective operation of engineering management of coal mine enterprises with more efficient security management systems and security management models.

3.2.3. The Engineering Management Methods of Some Coal Mine Companies Are Unscientific. In some private coal mine enterprises, some practitioners come from all over the world and are insufficient in the basic capabilities and quality of the
engineering management methods lacks strong execution. Due to the scientific model of engineering management, there is a large gap in the scientific optimization and implementation process of engineering management. In the process of first-line production, there are large hidden safety hazards. In the process of engineering management, we must not only pay attention to the training and training of people but also pay attention to the improvement of the system and the update and optimization of engineering management models. To promote the effective operation of engineering management with a more complete and accurate engineering management model. In the process of private coal mine enterprise engineering management, we must build a more complete set of engineering management models, so that the form of engineering management is more optimized, effectively avoiding hidden safety hazards, and effective control of engineering management. In Table 1, the organizational implementation framework of coal mine safety production education training is introduced [13, 14].

3.2.4. The Management of Engineering Management of Coal Mine Enterprises Lacks Supervision and Monitoring. In the process of engineering management, coal mine companies lack a relatively complete and sound monitoring and management mechanism. At the various stages of the implementation of engineering management, problems and system construction are insufficient, making the monitoring and feedback of engineering management insufficient. From the quality of the project, and in the process of safety in coal mine companies, the overall reflection of the artificial and institutional problems of the existence of coal mine companies is not enough, and the strength of supervision and supervision is not enough. The methods and measures for engineering management are greatly reduced in implementation. In the process of focusing on engineering management monitoring and management, we must pay attention to the monitoring and management of various elements of coal mine enterprises. Among the major domestic coal mine companies and private enterprises, the emphasis on coal mine production and engineering management processes and methods is insufficient. In terms of building engineering management supervision and monitoring and management mechanisms, major coal mine companies need to be vigorously remedied. In Figure 3, a comprehensive investigation of 4 factors affecting the management of coal mine enterprises, the results are as follows [15, 16].

4. Countermeasures for Engineering Management Issues of Coal Mine Enterprises

4.1. Construct a Perfect Talent Training Mechanism. In the process of promoting the efficient construction and long-term development of engineering management, coal mine companies must pay attention to the construction and improvement of the talent training mechanism. By using more scientific and efficient talent training mechanisms, the entire talent training is based on more efficient talents. In the process of engineering management of coal mine enterprises, on the one hand, we must pay attention to the basic requirements of new talents and improve the standards for selection of talents, and systematically cultivate talents. In the training of safety concepts, production processes, and basic grassroots work experience, build a set of optimized training measures for engineering management talents. On the other hand, for employees with a long working life, we must conduct on-the-job business training and retraining of engineering management systems to strengthen the institution of ideas. By constructing a complete talent training mechanism and systematic talent training, the long-term construction and implementation of engineering management measures are promoted. In the improvement and construction of the talent training system, through the construction and introduction of advanced scientific management models, with the important goal of talent training, it is optimized and dealt with in the process of engineering management. With the optimal engineering management model, the engineering technical management of construction personnel is realized. By improving employees’ work enthusiasm, building a more comprehensive talent training mechanism and bonus incentive mechanism based on the more effective talent training model, to allow the construction of talents is needed. The orderly connection and promotion of cultivation is shown in [17, 18]. In the process of improvement and construction of engineering and technical personnel, relying on the state and government departments to clarify the standards of engineering and technical personnel and the basic requirements of engineering management talents, through continuous optimization of training and learning processes, continuous optimization of engineering management talents, is observed. In Table 2, a comprehensive investigation was conducted on the organizational leadership of the engineering management mechanism.

4.2. Pay Attention to Efficient Management at Different Stages of Engineering Management. For the engineering management of coal mine enterprises, at different stages of engineering management, clear management measures and methods must be formulated, relying on efficient engineering management models, and formulating standardized and efficient constraints on the implementation of the project’s implementation process. In the range of a certain safety, improve economic benefits, increase output ratio,
...and steadily improved the overall benefits of the enterprise. In the process of engineering management, real-time inspections and monitoring treatment of hidden dangers to carry out safety issues must be fully integrated, and efficient institutional foundations are provided for the construction and implementation of engineering management with efficient engineering management monitoring mechanisms. In the process of comprehensive analysis of engineering management at various stages, relying on the technical standards and specifications of engineering management at different stages, the normalized engineering management constraint conditions are used as an important monitoring indicator to achieve effective monitoring and vertical management of engineering management. Build a coal mine safety supervision and management mechanism and achieve efficient monitoring of coal mining engineering management with more efficient management models and normal engineering management trends. In addition, at the various stages of coal mining engineering management, focusing on the effective implementation of the monitoring system, with a comprehensive and efficient safety supervision system and safety supervision system, it will achieve effective monitoring of engineering management processes at each stage. In Table 3, the operation and management of the safety supervision system of the coal mine enterprise were conducted in a detailed investigation.

4.3. Establish a Complete Coal Mine Safety Management Model. During the management of coal mine engineering, we must pay attention to the construction and improvement of the safety management system. Through the comprehensive analysis of some important safety indicators and influencing factors in the management process of coal mine engineering, effectively control, so that the important factors in the production of coal mine safety production, through comprehensive analysis of different influencing factors, have established a more complete improvement of the safety management evaluation index system. For uncontrollable factors encountered during the construction process, timely adjustment and optimization of engineering management to allow engineering management to monitor and protect the entire process of process have more scientific and reasonable monitoring indicators and allow safety management to establish optimized engineering management indicators for optimized engineering management indicators during the process [19, 20]. Construct a model process of the coal mine safety management system, and the model algorithm is determined as follows:

\[ A = a + t \times (f - s), \]  

where \( A \) is a safety indicator, \( a \) is the initial value of the safety index, \( t \) is the time, \( f \) is the influence rate, and \( s \) is the attenuation rate.

\[ f = b \times k. \]  

Among them, \( b \) is a security investment indicator and \( k \) is the influence coefficient.

\[ b = a + t \times c. \]  

Among them, \( c \) is the growth rate of security input. The three security risk assessment index coefficients constructed above are effectively evaluated, and variable scores

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Table 1: Organization implementation framework for coal mine safety production education training.

| Safety production education and training | Basic requirements for production safety education training | Basic knowledge and skills training | Carry out theoretical assessment and include usual performance |
|-----------------------------------------|----------------------------------------------------------|-----------------------------------|-----------------------------------------------|
| Safety production education and training | Objects, content, and time of production safety education training | The main person in charge of the coal mine enterprise | Clarify the content and safety focus of supervision and inspection |
| Safety production education and training | Organization of production safety education and training | Production personnel | Clarify the risk prevention of various working links |
| Safety production education and training | Organization of production safety education and training | Employees in business activities | Clarify risk prevention in business activities |
| Safety production education and training | Organization of production safety education and training | Special operator | Grasp the risk disposal of special operations |
| Safety production education and training | Organization of production safety education and training | Comprehensive organizational framework | Formulate implementation plans and normalize development |

**Figure 3:** The results of comprehensive investigation affecting the management factors of the engineering management of coal mine enterprises.

[Diagram showing the results of comprehensive investigation with percentages and categories: After the staff team construction, Increased institutional mechanism construction, Insufficient supervision, Safety awareness.]

**Table 2:**

| Risk Assessment Index | Coefficient | Description |
|----------------------|-------------|-------------|
| Safety index         | \( a \)     | Initial value of the safety index |
| Time                 | \( t \)     | Time of the process |
| Influence rate       | \( f \)     | Influence rate of the process |
| Attenuation rate      | \( s \)     | Attenuation rate of the process |
| Security investment  | \( b \)     | Security investment indicator |
| Influence coefficient| \( k \)     | Influence coefficient of the process |
| Growth rate          | \( c \)     | Growth rate of security input |

**Table 3:**

| Safety Production Education Training | After the staff team construction | Increased institutional mechanism construction | Insufficient supervision | Safety awareness |
|-------------------------------------|-----------------------------------|-----------------------------------------------|--------------------------|-----------------|
| Percentage                          | 25.40%                            | 15.50%                                        | 5.50%                    | 25.60%          |
are performed on the model. The analogy is taken as an actual safety factor for the management of the engineering management of coal mine enterprises. Continuously optimize in combination with the actual security measures and solutions of the enterprise and improve the degree of optimization of the company’s long-term production safety and engineering management.

4.4. Pay Attention to the Control of Quality Standards during the Management Process. In the process of engineering management of coal mine enterprises, we must not only focus on safety production but also pay attention to improving the overall production quality of the enterprise and improving economic benefits. Therefore, in the process of formulating and improving the engineering management plan, we must pay attention to the monitoring of the quality of the project.

By constructing an effective feedback mechanism and supervision and prevention mechanism, it provides an important monitoring mechanism for engineering management and project implementation. On the one hand, we must attach importance to safety production, and on the other hand, we must continue to improve the economic benefits of the enterprise and improve the quality of safety on the basis of safety production. In the long-term construction and development of enterprises, it has steadily improved the index system of the enterprise with a more complete and standardized quality of production. At the same time, in the process of continuously improving the enterprise’s safety production index system, the state and government departments should pay attention to comprehensive analysis of different influencing factors, establish a more comprehensive safety risk assessment model, and achieve a comprehensive

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**Table 2: Organization and leadership under the engineering management mechanism.**

| Leader of engineering management leading group | Technical department | Implement technology development and promote technological innovation |
|-----------------------------------------------|----------------------|---------------------------------------------------------------------|
| Chief engineer | Scientific research department | Product technology innovation, research and development of new products |
| Deputy chief production | Management | Engineering technology management |
| | Quality department | Overall responsibility for quality and safety |
| | Supervisory department | Real-time monitoring and management of safe production process |
| Deputy manager | Performance department | Effectively manage the performance of safe production |
| | Department of Finance | Complete the daily financial management of the enterprise, complete the cyclical financial statements |
| | Logistics department | Responsible for the overall logistics support work |
| | Marketing department | Monitor the quality of product marketing |
| | Supply department | Responsible for the supply of enterprise production safety factors |
| Vice president | Resource department | Reasonable control of production resources |
| | General affairs department | Manage the general affairs work |

**Table 3: Operation and management of the safety supervision system of coal mine enterprises.**

| Aspect | Project | Details |
|--------|---------|---------|
| Coal mine safety production supervision system | Implement vertical management | Comprehensive management from top to bottom |
| | Separation of monitoring and management | Partition management |
| | District supervision | Modular division of responsibility supervision and management |
| | National supervision | Supervision in accordance with national regulations |
| Daily supervision | Make random monitoring in combination with daily work |
| Key supervision | Supervise the process of key tasks and large projects |
| Special supervision | Supervise the special work from time to time |
| Regular supervision | Monitor according to seasonal safety characteristics |

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risk indicator system and quality monitoring methods to achieve realization and achieve realization. Efficient control and continuous optimization of engineering management of coal mine enterprises were done.

5. Conclusion

In the context of big data and the Internet of Things technology, this article conducts effective analysis and comprehensive investigations through comprehensive analysis and research on the current status of coal mine enterprise engineering management and lacks enough problems in the management process of coal mine engineering. We found that during the management of coal mine enterprises, there were a series of problems and deficiencies such as talent training and institutional mechanisms. This article focuses on the problems and deficiencies in the management process of coal mine engineering enterprises and conducts effective analysis of the problems and deficiencies, and the avoidance and measures of the problems have proposed targeted prevention methods. Cultivate the mechanism to achieve effective control and continuous optimization of the management of coal mine engineering.

In the process of engineering management, it is necessary to pay attention to the improvement of the mechanism and the effective control feedback on each key link. It is an important condition and foundation for promoting and improving the long-term construction and development of coal mine enterprise project management. In the process of long-term construction and development of enterprises, we must pay attention to the quality of the engineering management of coal mine enterprises at different development stages, conduct comprehensive assessment, and achieve effective control of engineering management through a more improved and efficient evaluation index system. Based on the background of big data and the Internet of Things, it is an important factor in promoting and driving the long-term construction of engineering management with a more complete engineering management measures that adapt to the background of the times and adapt to the background of the times.

Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest

It is declared by the author that this article is free of conflict of interest.

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