Original Research Article

Open Access

Omniscient Pte.Ltd.

Innovation of Scientific Supervision Methods in Engineering Supervision.

Yan-Fei Jin*

Gansu Provincial Transportation Science Research Institute Group Co.,Ltd. Hengke Supervision Company, Lanzhou, Gansu Province,730100,China

***Correspondence to:** Yan-Fei Jin,Gansu Provincial Transportation Science Research Institute Group Co.,Ltd. Hengke Supervision Company,Lanzhou,Gansu Province,730100,China,E-mail:107138150@qq.com

Abstract: With the continuous development and technological progress in the construction industry, engineering supervision, as an important link to ensure the quality, safety, progress, and efficiency of projects, requires continuous innovation in its supervisory methods to meet the demands of the new situation. This paper aims to explore innovative ideas for scientific supervision methods in engineering supervision, analyze the shortcomings of existing supervisory methods, and propose corresponding innovative strategies to improve the level and efficiency of engineering supervision.

Keywords: Engineering Supervision; Scientific Supervision Methods; Innovative Strategies

Introduction

Engineering supervision is an indispensable part of the construction process, with its main responsibility being the comprehensive supervision and management of the quality, safety, progress, and cost of projects. However, with the continuous expansion of construction scale and increasing technical requirements, traditional engineering supervision methods have become inadequate to meet the new development demands. Therefore, exploring innovative scientific supervision methods has become an important topic in the current field of engineering supervision.

1. Limitations in Traditional Engineering Supervision

1.1. Conceptual Constraints

Traditional engineering supervision methods are conceptually limited, primarily manifested in the insufficient understanding of their respective roles by construction and supervision units. Both parties often view each other as adversaries, leading to clear contradictions and a mere fulfillment of supervisory responsibilities. This conceptual limitation results in several practical issues. Firstly, there is a lack of cooperation and teamwork spirit between the parties, making it difficult to establish effective collaboration mechanisms, thus hindering the smooth progress of engineering supervision work. Secondly, due to the existence of hostile emotions, communication barriers hinder timely and effective information transmission and problem-solving, potentially leading to blame-shifting and disputes between the parties, significantly impacting the efficiency and quality of engineering supervision.

1.2 Single Supervisory Methods

Traditional engineering supervision methods appear

relatively single in terms of supervisory means, primarily relying on manual inspections and on-site checks excessively. Traditional supervisory personnel typically need to visit construction sites to visually inspect and assess the quality and progress of the projects. However, this single supervisory approach is not only inefficient but also susceptible to human and environmental limitations. While manual inspections and on-site checks provide visual insights into the construction site, they often fail to comprehensively cover all aspects and details of the construction process. Moreover, supervisory personnel are often restricted by time, space, and safety concerns during on-site inspections, unable to conduct comprehensive and thorough supervision. Especially in high-risk and complex construction environments, single supervisory methods struggle to cope with various unexpected situations and challenges. Additionally, the singularity of traditional engineering supervision methods is also reflected in the insufficient utilization of information technology[1].

1.3 Low Level of Informatization

The inadequate level of informatization is mainly reflected in the lagging data collection, processing, and application processes during supervision, along with a lack of efficient information management system support. Under the traditional engineering supervision mode, supervisory personnel often rely on manual records, paper documents, and oral communication for information transmission and sharing. This approach is not only inefficient but also prone to issues such as information loss, errors, and delays. The low level of informatization results in insufficient transparency and traceability in supervision work, making it challenging for supervisory personnel to comprehensively and accurately analyze and evaluate various data and information during the construction process. Consequently, supervisory decisions often lack scientific and precise guidance, making it difficult to effectively address complex problems and challenges in engineering construction. Additionally, the low level of informatization limits the collaborative and adaptive capabilities of supervision work. Due to the lack of effective information communication and sharing platforms, collaboration among supervisory personnel and between supervisory units and other participating units is greatly restricted, hindering the formation of efficient work mechanisms and collaborative efforts. When dealing with emergencies and issues, low-level informatization in supervisory methods often fails to respond and adjust promptly, resulting in passive and delayed supervision work.

1.4 Insufficient Preventive Measures

Traditional engineering supervision methods exhibit significant deficiencies in preventive measures. This is primarily manifested in excessive emphasis on on-site supervision and management during the construction process, while neglecting preventive supervision in pre-construction stages such as design and bidding. The traditional supervisory model typically reacts to problems after they occur, lacking foresight and anticipation, thus resulting in unsatisfactory supervisory outcomes. Due to the lack of preventive measures, traditional engineering supervision methods often struggle to identify and recognize potential construction risks and issues promptly. Consequently, some problems that could have been avoided through preventive measures in the early stages evolve into serious quality, safety, or progress issues. This not only brings unnecessary losses and difficulties to engineering construction but also increases the complexity and difficulty of supervision work. Additionally, insufficient preventive measures often render traditional engineering supervision methods passive in problem-solving. Due to the lack of effective preventive supervision measures, supervisory personnel can only resort to emergency handling and remediation after problems occur, failing to address issues fundamentally. This passive approach not only affects the efficiency and effectiveness of supervision work but also diminishes the authority and influence of supervisory personnel in engineering construction.

2. Innovation Strategies for Scientific Supervision Methods

2.1 Paradigm Shift

To innovate scientific supervision methods, it is necessary to break the conceptual limitations first. Supervisory units should change their mindset, clarify their role positioning, and understand that the essence of supervision work is to provide services to construction units, ensuring their compliance with contractual requirements, minimizing resource wastage, and maximizing benefits. Supervisory units

are not merely supervisors but also partners who help construction units identify deficiencies, optimize management, and enhance efficiency during project implementation. Through scientific supervision, construction units can be assisted in finding the optimal balance between quality, progress, and costs, thus achieving smooth project advancement and high-quality completion. Additionally, supervisory units should take responsibility for protecting the legitimate rights and interests of owners, construction units, and other stakeholders. Throughout the supervision process, adherence to principles of fairness and justice is essential to ensure that the interests of all parties are reasonably safeguarded. Strengthening communication and collaboration, and building mutual trust relationships, supervisory units can better serve as bridges and facilitators, promoting concerted efforts towards project success. Innovating scientific supervision methods requires elevating awareness, clarifying the service nature of supervision, and fostering partnership relations to achieve efficient project advancement and mutual benefits.

2.2 Introduction of Intelligent Supervisory Methods

With the rapid development of technology, intelligent technology brings unprecedented opportunities to the field of engineering supervision. Intelligent supervisory methods mainly utilize advanced technologies such as the Internet of Things (IoT), big data, and artificial intelligence (AI) to achieve real-time monitoring and intelligent analysis of the entire construction process. By installing sensors, cameras, and other monitoring devices, real-time data on various aspects of the construction site, such as temperature, humidity, wind speed, construction progress, material usage, etc., can be collected. These data are transmitted to intelligent analysis systems through IoT technology, where they are processed and analyzed to provide comprehensive insights into the construction site conditions and issue warnings. The application of intelligent supervisory methods greatly enhances the efficiency and accuracy of supervision work. Traditional supervisory methods often rely on manual inspections and on-site checks, which are not only time-consuming but also difficult to achieve comprehensive coverage. Intelligent supervisory methods enable round-the-clock, comprehensive monitoring, facilitating timely issue detection and resolution, thereby reducing the workload and pressure on supervisory personnel[2]. Additionally, intelligent supervisory methods provide scientific data support, aiding supervisory personnel in making more informed decisions. By analyzing and mining large amounts of data, patterns and trends in the construction process can be identified, potential issues and risks predicted, and preventive measures taken in advance to prevent problems from arising.

2.3 Enhancement of Informatization Level

The application of information technology can significantly promote the modernization of engineering supervision, enhancing supervision efficiency and quality. Enhancing the level of informatization first involves constructing a comprehensive and efficient information management system. This system integrates various data and information generated during the construction process, including design documents, construction drawings, progress reports, quality inspection reports, etc., enabling centralized storage and rapid retrieval of information. Through this system, supervisory personnel can access the required information anytime, anywhere, keeping abreast of the latest developments in construction projects and making rapid and accurate decisions. Furthermore, enhancing the level of informatization requires strengthening information sharing and collaborative work during supervision. By establishing an information-sharing platform, supervisory personnel can communicate and share information with other participating units in real-time, forming an efficient working mechanism and collaborative synergy. This collaborative work approach not only improves work efficiency but also reduces errors and delays in information transmission, ensuring the accuracy and timeliness of supervision work. The enhancement of informatization level also provides more precise data support for engineering supervision. By utilizing big data analysis and mining techniques, in-depth analysis and processing of vast amounts of data generated during the construction process can reveal underlying patterns and trends. These analytical results can provide scientific basis for supervisory decisions, helping supervisory personnel to grasp the direction and focus of engineering construction more accurately.

2.4 Strengthening Preventive Supervision

Preventive supervision aims to identify potential

problems and risks in advance during the construction process through proactive thinking and actions, thus ensuring smooth progress and quality safety of engineering projects. Strengthening preventive supervision requires supervisory personnel to have keen insight and rich experience. They should be able to identify potential design flaws and risks by carefully reviewing design documents and construction drawings in the early stages of construction. Additionally, they should conduct comprehensive and meticulous investigations and assessments of construction sites to identify potential safety hazards and construction quality issues promptly. To strengthen preventive supervision, supervisory personnel also need to maintain close communication and collaboration with other participating units. They should work with design units, construction units, and other relevant parties to jointly formulate preventive measures and emergency plans, defining the responsibilities and tasks of each party. Through regular meetings and exchanges, supervisory personnel can keep abreast of the latest developments and potential issues in construction projects, enabling them to take corresponding preventive measures promptly. Furthermore, strengthening preventive supervision also requires leveraging advanced technological means. For example, utilizing non-destructive testing technology for regular inspections of critical components, employing numerical simulation techniques to simulate and analyze complex construction processes, and employing intelligent monitoring.

3. The Significance of Innovating Scientific Supervision Methods

3.1 Enhancing Supervision Efficiency

Innovating scientific supervision methods holds profound significance for enhancing supervision efficiency. Traditional supervisory methods are often time-consuming, labor-intensive, and inadequate in covering the entire process of construction, resulting in low supervision efficiency. In contrast, innovative scientific supervision methods utilize advanced technologies such as intelligentization and informatization to achieve real-time monitoring and intelligent analysis of the entire construction process, significantly reducing the workload of manual inspections and on-site checks. This innovative supervision approach not only facilitates the rapid and accurate detection and resolution of issues but also provides early warnings of potential risks, thereby avoiding unnecessary rework and delays. Therefore, the application of innovative scientific supervision methods can significantly improve supervision efficiency, saving time and costs in construction projects while ensuring quality, safety, and progress, injecting new vitality into the continuous development of the supervision industry.

3.2 Enhancing Supervision Quality

Innovating scientific supervision methods are of paramount importance in enhancing supervision quality. Traditional supervisory methods are often constrained by human factors and environmental conditions, making it difficult to ensure the accuracy and reliability of supervision results. In contrast, innovative scientific supervision methods, by introducing advanced technological means such as intelligent monitoring and big data analysis, enable comprehensive and in-depth supervision of the construction process. This approach not only enhances the precision and traceability of supervision but also effectively reduces human errors and omissions. Therefore, the application of innovative scientific supervision methods can significantly improve supervision quality, ensuring effective assurance of the quality, safety, and progress of construction projects. Furthermore, this sets higher standards for the supervision industry, driving progress and development across the entire sector.

3.3 Reducing Engineering Risks

Innovating scientific supervision methods hold far-reaching significance in reducing engineering risks. Traditional supervisory methods often fall short when faced with complex and ever-changing construction environments and potential risks. In contrast, innovative scientific supervision methods, through the application of intelligentization, informatization, and other technologies, can monitor the entire construction process in real-time, promptly identifying potential safety hazards and quality issues to take preventive measures and mitigate risks. This proactive supervision approach not only enhances the ability to respond to risks but also effectively reduces the probability of engineering risks occurring[3].

Conclusion

This article discusses innovative approaches to scientific supervision methods in engineering

supervision and proposes corresponding innovative strategies. The implementation of these strategies will help improve the level and efficiency of engineering supervision, ensuring the quality, safety, progress, and benefits of projects. Looking ahead, with the continuous advancement of technology and the deepening of innovative concepts, engineering supervision will encounter broader development opportunities and more severe challenges. Therefore, we need to continuously explore and innovate engineering supervision methods to adapt to the evolving needs of the new situation and promote the sustainable development of the engineering supervision industry.

References

[1] Chen W,Y. On the key points and implementation of housing construction supervision[J].*Sichuan Cement*,2020(12):145-146.

[2] Wang C. Analysis on the key points and implementation of housing construction supervision[J]. *Popular Standardization*,2020(11):98-99.

[3] Yang H. Some thoughts on China's construction engineering supervision industry[J].*Construction Supervision*, 2019,(06):5-6+49.