Research on IT Engineering Project Resource Management System Based on Artificial Intelligence

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Abstract: ***With the rapid development of information technology, the complexity and scale of IT engineering projects continue to increase, and resource management faces new challenges, especially in high-tech projects such as facial recognition systems, where efficient resource allocation is particularly important. The article explores the application of artificial intelligence technology in IT engineering project resource management, analyzes its successful cases in different industries, and its profound impact on resource management. Through data analysis and decision support, artificial intelligence helps project managers reduce risks and optimize decisions. In addition, intelligent optimization algorithms have improved resource allocation efficiency and demonstrated significant results in the development of facial recognition systems. The article also focuses on human resource management in the requirements analysis stage, elaborating on how artificial intelligence can optimize team building and resource allocation, demonstrating its unique value in improving project management efficiency and resource optimization.***

Keywords: Artificial intelligence; IT engineering; Resource Management System.

1. INTRODUCTION

In recent years, the rapid development of artificial intelligence technology has provided a new solution to this problem. From transportation to healthcare, from manufacturing to finance, various industries are utilizing artificial intelligence for data analysis, optimizing resource allocation, and achieving intelligent decision-making. The country has also issued a series of policy documents. In August 2022, the Ministry of Science and Technology and six other departments jointly issued the "Guiding Opinions on Accelerating Scene Innovation and Promoting High quality Economic Development through High level Application of Artificial Intelligence", emphasizing the use of scene innovation to promote the deep application of artificial intelligence in various industries and enhance the level of high-quality economic development. In June 2024, the Ministry of Industry and Information Technology and four other departments issued the "Guidelines for the Construction of the National Artificial Intelligence Industry Comprehensive Standardization System (2024 Edition)", aiming to strengthen the standardization work of artificial intelligence and promote the healthy and sustainable development of the industry. However, how to fully leverage the role of artificial intelligence in practical projects and improve resource management efficiency remains a complex issue. This article will explore the practical application of artificial intelligence in IT engineering project resource management and reveal the profound impact brought by this technology. Xie et al. [1] proposed a Conv1D-based approach for multi-class classification in legal citation text, achieving improved accuracy and efficiency. Similarly, Xu et al. [2] utilized YOLOv5 for real-time detection of Crown-of-Thorns Starfish in automated surveillance systems, showcasing the practical applications of deep learning in marine conservation. Yin et al. [3] further extended the use of deep learning for crystal system classification in lithium-ion batteries, contributing to advancements in energy storage technology. In the field of e-commerce, Luo et al. [4] enhanced chatbots using Falcon-7B and 16-bit full quantization, improving both performance and resource utilization. In addition to these applications, Yan et al. [5] investigated image super-resolution reconstruction using convolutional neural networks, demonstrating its potential in improving image quality. Pang et al. [6] leveraged electronic health records for diabetes knowledge unveiling and risk prognosis, highlighting the role of data-driven approaches in healthcare. Long et al. [7] improved educational content matching through transformer models and InfoNCE loss, contributing to personalized learning experiences. Tang and Zhao [8] studied the relationship between aging population distribution and real estate market dynamics using neural networks, while Wu [9] focused on fault detection and prediction in cloud infrastructure models to optimize resource usage. Yao [10] conducted research on the local head loss coefficient in short-tube hydraulic testing, providing insights into fluid mechanics. Zhao et al. [11] evaluated labor market efficiency under the impact of media news using machine learning and the DMP model. Chen et al. [12] explored the green innovation effect of the digital economy, emphasizing sustainability in economic development. Meng et al. [13] optimized green

warehousing logistics site selection and path planning based on deep learning, contributing to environmentally friendly supply chain management. Wang et al. [14] generated a cell atlas of the immune microenvironment in gastrointestinal cancers, advancing our understanding of immune responses in disease. Furthermore, Li and Evans [15] discussed interactive data exploration for smart city analytics from a user-centered perspective, emphasizing the importance of user experience in urban planning. Song [16] enhanced human-centric logistics decision-making with AI-driven route optimization and predictive insights, while Wang [17] focused on predictive modeling for sortation and delivery optimization in e-commerce logistics. LI and Wang [18] proposed a deep learning-enhanced adaptive interface for improved accessibility in e-government platforms, promoting digital inclusivity. Yang [19] applied LightGBM in the Chinese stock market, demonstrating its efficacy in financial forecasting.

2. THE IMPORTANCE OF APPLYING ARTIFICIAL INTELLIGENCE TECHNOLOGY TO IT ENGINEERING PROJECT RESOURCE MANAGEMENT

2.1 Application Status of Artificial Intelligence in IT Engineering Project Management

The application of artificial intelligence (AI) in IT engineering project management has become an important trend in current technological development, driving significant improvements in project management efficiency and decision quality. At present, the application of AI is particularly prominent in the following fields:

2.1.1 Project planning and scheduling

Artificial intelligence analyzes various project data through intelligent algorithms to help managers optimize schedule and resource allocation. AI systems can predict potential delay risks of projects based on real-time data and historical patterns, and provide corresponding adjustment suggestions to ensure timely delivery of projects. This automated planning approach greatly reduces human errors and enhances the controllability and reliability of the project.

2.1.2 Resource allocation and optimization

The application of AI in resource management is reflected in the dynamic allocation of human, material, and financial resources. By monitoring and analyzing resource usage in real-time, artificial intelligence can quickly adjust resource allocation to meet changes in project requirements. Especially in large and complex projects, AI technology can help enterprises reduce costs, improve resource utilization, and avoid resource waste or shortage.

2.1.3 Risk management and prediction

Using machine learning models, AI can analyze massive project data, identify potential risks, and propose response strategies. Currently, many IT project teams have introduced AI into the risk prediction process, anticipating key challenges in the project and providing decision support for managers. For example, AI can predict issues such as budget overruns, personnel shortages, or schedule deviations, and develop corresponding mitigation plans for the team to reduce the likelihood of project failure.

2.2 Penetration and Impact of Artificial Intelligence on IT Engineering Project Resource Management

In IT engineering projects, resource management involves effective coordination of various resources such as manpower, time, and budget to ensure the smooth progress of the project. However, with the increasing complexity of projects, traditional resource management methods have gradually exposed their limitations in responding to changing demands and frequent adjustments. The introduction of artificial intelligence technology provides innovative solutions to this problem, greatly improving the efficiency and accuracy of project management.

2.2.1 Real time data analysis and prediction

Artificial intelligence has real-time data analysis capabilities, enabling project managers to grasp comprehensive and dynamic resource utilization information. AI algorithms can analyze project progress, resource utilization, and market environment changes, predict potential risks, and issue warnings. For example, intelligent prediction models can predict changes in human resource demand based on historical and real-time data, helping managers to arrange team work reasonably and avoid resource waste or shortage.

2.2.2 Automated Process Management

Artificial intelligence simplifies the tedious project management process. In the past, project managers needed to spend a lot of time on resource allocation and monitoring, while AI systems could automate these tasks, such as assigning tasks, matching suitable personnel, and coordinating team collaboration. In addition, intelligent assistants based on natural language processing can quickly generate reports, optimize processes, reduce manual intervention, and improve management efficiency.

2.2.3 Intelligent Decision Support

AI provides data-driven decision support for project managers. Through machine learning and deep learning models, AI systems can analyze massive project data, identify hidden patterns and trends, and propose resource allocation optimization solutions. For example, in facial recognition system development projects, AI can allocate more algorithm engineers based on task complexity and progress recommendations to ensure timely delivery.

2.3 Advantages of Artificial Intelligence in IT Engineering Project Resource Management

Artificial intelligence technology has demonstrated significant advantages in IT engineering project resource management:

(1) AI improves efficiency through automated management and can perform repetitive tasks such as resource allocation and progress monitoring, reducing human errors and saving a lot of time.

(2) The real-time data analysis capability of AI enables managers to quickly obtain comprehensive project status information, predict resource requirements and potential risks, and ensure smooth project progress.

(3) The data-driven decision support provided by AI analyzes project data through machine learning models, optimizes resource allocation strategies, and helps project teams achieve optimal results in resource limited situations. Especially in complex projects such as facial recognition systems, AI algorithms can flexibly adjust resource allocation to ensure efficient project progress.

3. DATA ANALYSIS AND DECISION-MAKING

In IT engineering project resource management, the data analysis capability of artificial intelligence provides great support for decision-making. Traditional decision-making methods often rely on the experience and intuition of managers, and when faced with complex project requirements and changes, there may be issues of insufficient information or misjudgment.

3.1 Data Collection and Analysis

Artificial intelligence systems can automatically collect and integrate information from multiple sources, such as project progress, human resource distribution, budget utilization, etc., and use big data analysis models to identify key trends and potential risks. This real-time data analysis capability helps managers comprehensively grasp the project status, identify problems in advance, and make adjustments. For example, in the development of facial recognition systems, AI can track development progress, analyze resource utilization, and predict future resource demands to ensure rational and efficient resource allocation.

The real-time monitoring function of AI can also provide dynamic feedback, allowing project managers to adjust strategies at any time to adapt to changing project requirements and external environments. This continuous data analysis ensures the optimal allocation of project resources and effectively reduces waste and risks caused by information lag or judgment errors. In addition, by analyzing historical data, artificial intelligence can help identify patterns in resource usage, providing valuable references for future project planning and resource management.

3.2 Auxiliary decision-making and risk management

The predictive analysis function of AI can simulate various risks that a project may face and propose corresponding response strategies. Machine learning models can analyze the advantages and disadvantages of

different configuration schemes, helping managers choose the optimal resource allocation strategy and reduce potential risks in projects. This data-driven decision support enhances the flexibility and adaptability of project management. When there are deviations in project progress, the AI system can provide adjustment suggestions, enabling the team to quickly respond and reduce losses.

With the help of artificial intelligence, managers can transform the decision-making process from traditional passive response to proactive prevention. AI can not only identify current problems, but also predict potential challenges in the future, providing managers with response strategies. For example, during the development phase, AI can predict that a certain functional module may require more testing resources and alert the team in advance to prepare, thereby reducing risks and improving efficiency. This efficient risk management mechanism enables projects to maintain stable progress in complex environments.

4. APPLICATION OF INTELLIGENT OPTIMIZATION ALGORITHMS IN ENGINEERING PROJECT MANAGEMENT

Intelligent optimization algorithms are a type of computing method based on artificial intelligence technology, aimed at finding the optimal or approximate optimal solution to complex problems by simulating natural or human intelligent behavior. Common intelligent optimization algorithms include genetic algorithm, particle swarm optimization algorithm, ant colony algorithm, and sparrow search algorithm.

For example, the energy efficiency optimization case of Google data centers fully reflects its practical application. To address the issues of high energy consumption and complex resource allocation, Google has deployed advanced sensor networks to monitor environmental parameters in real-time, such as temperature, humidity, and server load. Through the data collected by these sensors, deep reinforcement learning algorithms are able to analyze and dynamically optimize the operational strategies of cooling systems. Intelligent optimization algorithms continuously adjust the cooling system based on environmental and load changes, ensuring efficient resource utilization and minimizing energy consumption. Unlike traditional static management methods, this adaptive adjustment significantly improves operational efficiency and reduces cooling costs. Algorithms can also predict potential load fluctuations, optimize resource allocation in advance, ensure system stability, and reduce the risk of unexpected problems. This optimization approach not only achieves efficient management, but also provides sustainable solutions, demonstrating the powerful potential of intelligent algorithms in resource scheduling and project efficiency improvement. This case provides valuable experience reference for other IT engineering project management, especially in resource intensive projects, where the application prospects of intelligent optimization algorithms are even broader [4].

5. RESOURCE MANAGEMENT DURING THE REQUIREMENTS ANALYSIS PHASE

In the requirements analysis phase of IT engineering projects, resource management is particularly critical. Requirement analysis is the fundamental stage of the entire project development process, and its accuracy and comprehensiveness directly affect the smooth progress of subsequent development work and the overall success or failure of the project. At this stage, the core of resource management lies in efficiently allocating human resources and laying a solid foundation for the long-term development of the project.

The requirements analysis phase requires a team with diverse skills and highly collaborative abilities. This typically includes project managers, system analysts, user experience experts, data engineers, architects, and domain experts. The professional skills of each member must match the specific needs of the project, therefore, selecting and allocating suitable personnel is the primary task of resource management. Artificial intelligence technology can provide optimized team composition recommendations by analyzing personnel's skill data and project requirements, ensuring that team members perform their duties and maximize their effectiveness in the requirements analysis process.

The coordination and dynamic adjustment of human resources are crucial. The work in the requirements analysis stage often involves a large amount of user requirements research, data collection and analysis, requirement document writing and review activities, which may be affected by customer feedback, market changes, and project scale adjustments at any time. Therefore, project managers need to have flexible resource management strategies.

Artificial intelligence systems can monitor team work progress in real-time, analyze data, and predict changes in resource requirements, helping managers respond quickly and adjust human resource allocation.

In the requirements analysis stage, it is not only important to focus on the allocation of human resources, but also to effectively manage time and other auxiliary resources such as research equipment, data tools, and work environment. Developing a reasonable work plan and allocating sufficient time for requirement verification and adjustment are key to ensuring the accuracy of analysis results. Artificial intelligence technology can optimize work plans and reduce resource waste by analyzing project progress and resource utilization, ensuring that teams can efficiently complete tasks while maintaining work quality.

6. CONCLUSION

Artificial intelligence is rapidly reshaping the landscape of IT engineering project resource management, demonstrating enormous potential in optimizing decision-making processes, improving efficiency, and reducing resource waste. Faced with an increasingly complex and dynamic project environment, traditional management methods seem inadequate, and the introduction of AI has brought profound changes to this field. Through data-driven decision-making and intelligent optimization algorithms, managers can allocate and adjust resources more accurately, and proactively respond to various challenges in projects. Especially in the requirements analysis stage, the application of artificial intelligence technology can ensure more scientific and reasonable resource allocation, laying a solid foundation for the subsequent development of the project. This not only improves the flexibility and adaptability of the overall project, but also promotes the transformation of resource management from experience driven to data-driven. This change marks a new era of intelligent project management.

However, the development of artificial intelligence in IT project management still faces constantly changing demands and technological challenges. In the future, only by continuously exploring new application scenarios of AI technology and optimizing existing methods can its potential be fully unleashed, providing more comprehensive solutions for project management. Continuous innovation and practice will drive progress in this field, helping businesses respond to rapidly changing industry demands and achieve sustainable development and long-term success.

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Author Profile

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