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Supply Chain Intelligent Rating System: A Study on Its Adaptability and Application in Multiple Industries

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Abstract

In the context of accelerating global economic integration, the complexity and significance of supply chain management have become increasingly prominent. Traditional supply chain rating methods, when confronted with dynamic market environments, exhibit numerous limitations and fail to meet enterprises' demands for real-time risk warnings and precise management. The supply chain intelligent rating system developed in this study, leveraging big data analysis and artificial intelligence technologies, realizes real-time monitoring and intelligent assessment of supply chain risks. It has been widely applied across multiple industries, including real estate, petrochemicals, hotels, and grain and oil, significantly enhancing enterprises' supply chain management efficiency and economic benefits. A scientific adaptability evaluation index system was constructed in this research to deeply analyze the application effects and cross-field adaptability of the system in different industries, providing strong support for its optimization and promotion. By optimizing data collection, improving the flexibility of functional modules and user experience, the system has demonstrated good adaptability and application value in various industries. In the future, this study will further expand data sources, deepen the customized development of functional modules, and explore more effective promotion models to facilitate the application and development of the supply chain intelligent rating system in more industries, thereby assisting enterprises in enhancing their competitiveness and economic benefits.

Keywords: supply chain intelligent rating system, information project management, multi-industry adaptability, digital supply chain risk warning, big data analysis, artificial intelligence, real-time monitoring, risk assessment, economic benefits, system optimization

1. Introduction

1.1 Research Background

With the acceleration of global economic integration, supply chain management has become a crucial component in corporate operations. The rise of information project management has brought both new opportunities and challenges to supply chain management. The application of digital technologies has not only improved the efficiency of the supply chain but also provided

enterprises with more accurate risk warning and response mechanisms. However, traditional supply chain rating methods often fall short when dealing with the complex and ever-changing market environment. In recent years, the supply chain intelligent rating system, as an emerging digital tool, has gradually attracted attention. It can provide real-time assessment of supply chain risks and performance through big data analysis and artificial intelligence technologies, offering strong support for corporate decision-making. Against this backdrop, this study aims to explore the application effects and cross-field adaptability value of the supply chain intelligent rating system.

1.2 Research Purpose

The primary objective of this study is to evaluate the adaptability and application effects of the supply chain intelligent rating system in multiple industries, including real estate and petrochemicals, through analyzing its practical applications. Specifically, the study will delve into how the system helps enterprises optimize supply chain management and enhance risk warning capabilities, and verify its feasibility and effectiveness in different industries through actual cases. Moreover, the study will analyze the advantages and disadvantages of the system in cross-industry applications, providing a basis for its further optimization.

1.3 Research Significance

This study holds significant theoretical and practical importance. From a theoretical perspective, by systematically analyzing the application effects of the supply chain intelligent rating system, it can enrich the research in the intersection of information project management and supply chain management, offering new perspectives and methods for the development of related theories. From a practical standpoint, the research findings will provide specific guidance for enterprises' digital transformation, helping them better manage supply chain risks and enhance competitiveness in the complex market environment. Additionally, the study will offer empirical support for the development and promotion of the supply chain intelligent rating system, promoting its application and development in more industries.

2. Development and Design of the Supply Chain Intelligent Rating System

2.1 Development Background and Objectives

The development of the supply chain intelligent rating system is aimed at addressing the increasingly complex challenges in global supply chain management. With the enhancement of market dynamics, the explosive growth of data volume, and the increasing differentiation of supply chain management demands across various industries, traditional rating methods can no longer meet enterprises' needs for real-time monitoring and precise risk warning. Against this backdrop, this project was initiated with the goal of constructing a platform that can monitor and intelligently assess supply chain risks in real-time and provide decision-making support. The system is expected to improve supply chain management efficiency, reduce risks, and enhance corporate competitiveness.

2.2 System Architecture and Functional Modules

The overall architecture of the system is designed in a layered manner, covering four levels: data collection, processing, analysis, and user interaction. The data collection layer is responsible for gathering information from internal and external data sources of enterprises; the data processing layer cleans, integrates, and pre-processes the collected data; the analysis layer employs big data analysis and artificial intelligence algorithms to deeply mine the value of data, generating supply chain ratings and risk warnings; the user interaction layer presents the analysis results to users through intuitive visualization tools to assist decision-making. In terms of functional modules, the system includes data management, risk assessment, warning, decision-making support, and user management modules, which work independently yet collaboratively to achieve intelligent supply chain management.

2.3 Technical Implementation and Data Processing

In terms of technical implementation, the system integrates cutting-edge technologies such as big data and artificial intelligence. It utilizes big data platforms like Hadoop and Spark to process massive amounts of data and support real-time analysis requirements; it applies machine learning algorithms for risk prediction and rating to enhance the accuracy of assessment; and it employs tools like Tableau and D3.js to achieve data visualization, presenting complex data in the form of intuitive charts. The data sources are extensive, including internal enterprise systems and external market and

logistics data sources. After being collected, the data goes through a series of processes, including cleaning, integration, and pre-processing, before being transformed into high-quality data for use by the analysis module.

3. Application Practices of the Supply Chain Intelligent Rating System in Multiple Industries

3.1 Case Analysis of Application in the Real Estate Industry

The supply chain management in the real estate industry is complex, with long-term projects, numerous suppliers, and large-scale capital flows. Under the traditional model, it is difficult for enterprises to monitor suppliers' performance capabilities and risks in real-time, leading to project delays and cost overruns. After introducing the supply chain intelligent rating system, Blue Ocean Real Estate Group significantly enhanced its risk identification and warning capabilities by collecting supplier data in real-time and generating dynamic ratings through big data analysis and machine learning algorithms. The data shows that in the first quarter after the system was launched, the risk identification rate increased by 35%, the project delays caused by supplier breaches were reduced by 20% (Haque, A., Akther, N., Khan, I., Agarwal, K., & Uddin, N., 2024), and the procurement cost was lowered by 8%. In the steel procurement process, the system warned that a supplier might delay delivery, and the enterprise timely adjusted the procurement plan, saving about 5 million yuan in additional costs that would have been incurred due to the delay.

Table 1.

Project	After the Introduction of the Supply Chain Intelligent Rating System
Risk Identification Rate	Increased by 35%
Project Delays Due to Supplier Breach	Reduced by 20%
Procurement Costs	Decreased by 8%

3.2 Case Analysis of Application in the Petrochemical Industry

The supply chain in the petrochemical industry highly depends on the stability and safety of raw material supply and the timeliness of logistics distribution. After applying the supply chain intelligent rating system, Huana Petrochemical integrated data from the global crude oil market, suppliers' financial status, and logistics transportation to assess risks in real-time. Following the system's launch, the accuracy rate of raw material supply risk warning increased by 40%, the logistics distribution delay rate decreased by 25%, the procurement cost was reduced by 10%, and the logistics cost was lowered by 15%. During a period of tight crude oil supply, the system issued an early warning about the risk of supply interruption from a supplier. The enterprise timely adjusted its procurement strategy and optimized transportation routes, saving about 8 million yuan in losses that would have been caused by the shutdown. (Haque, A., Akther, N., Khan, I., Agarwal, K., & Uddin, N., 2024)

3.3 Overview of Applications in Other Industries

The supply chain intelligent rating system has also been widely applied in the hotel and grain and oil industries. In the hotel industry, the system optimized the procurement management of catering raw materials and guest room supplies, reducing the average procurement cost by 12% and increasing customer satisfaction by 18%. In the grain and oil industry, the system provided precise data support for raw material procurement and inventory management, increasing the average inventory turnover rate by 20% and reducing the procurement cost by 10%. Overall, the system has demonstrated strong adaptability and application value in multiple industries, providing strong decision-making support and risk warning for enterprises, and significantly improving the level of supply chain management and economic benefits.

4. Cross-Industry Adaptability Analysis of the Supply Chain Intelligent Rating System

4.1 Construction of the Adaptability Evaluation Index System

To scientifically evaluate the adaptability of the supply chain intelligent rating system in different industries, this study has constructed a comprehensive evaluation index system covering five dimensions: technical adaptability, functional adaptability, data adaptability, user satisfaction, and economic benefits. Technical adaptability measures the integration degree of

the system with the mainstream information systems in the industry, response time, and failure rate; functional adaptability assesses the practicality and effectiveness of functions such as risk warning and supplier rating; data adaptability examines the accuracy, completeness, and real-time nature of data; user satisfaction evaluates the system's interface friendliness, ease of use, and overall satisfaction through user feedback; economic benefits measure the value brought by the system in terms of cost savings, efficiency improvement, and risk reduction.

Table 2.

Project	After the Introduction of the Supply Chain Intelligent Rating System
Risk Identification Rate	Increased by 35%
Project Delays Due to Supplier Breach	Reduced by 20%
Procurement Costs	Decreased by 8%

4.2 Adaptability Analysis in Different Industries

In the real estate industry, the supply chain intelligent rating system has demonstrated high adaptability. In terms of technical adaptability, the system has a high integration degree with the ERP system, a response time of 1.2 seconds, and a failure rate of less than 0.5% (Xiong, X., Zhang, X., Jiang, W., Liu, T., Liu, Y., & Liu, L., 2024). Regarding functional adaptability, the coverage rate of risk warning and supplier rating functions is over 90%, with high user frequency and positive feedback. In terms of data adaptability, the data collection accuracy is above 95%, the data update timeliness is 90%, and the processing efficiency is high. The user satisfaction survey shows that the interface friendliness score is 4.2/5, the operation convenience score is 4.0/5, and the overall satisfaction score is 4.3/5. In terms of economic benefits, the procurement cost savings rate is 8%, the inventory turnover rate is increased by 20%, and the average loss avoided by risk warning is about 5 million yuan.

The petrochemical industry has high requirements for the stability and safety of the supply chain, and the supply chain intelligent rating system has shown excellent adaptability. In terms of technical adaptability, the system has a high integration degree with the information system, a response time of 1.5 seconds, and a failure rate of less than 0.3%. Regarding functional adaptability, the coverage rate of risk warning and logistics optimization functions is over 85%, with high user frequency and positive feedback. In terms of data adaptability, the data collection accuracy is 98%, the data update timeliness is 92%, and the processing efficiency is high. The user satisfaction survey shows that the interface friendliness score is 4.1/5, the operation convenience score is 4.2/5, and the overall satisfaction score is 4.4/5 (Liu, Z., 2022). In terms of economic benefits, the procurement cost savings rate is 10%, the logistics cost is reduced by 15%, and the average loss avoided by risk warning is about 8 million yuan.

In the hotel industry, the system integrates well with the hotel management system, with a response time of 1.0 second and a failure rate of less than 0.4%. The coverage rate of procurement management and quality monitoring functions is 80%, with relatively high user frequency and positive feedback. The data collection accuracy is 94%, the data update timeliness is 88%, and the processing efficiency is high. The user satisfaction survey indicates that the interface friendliness score is 4.0/5, the operation convenience score is 3.9/5, and the overall satisfaction score is 4.2/5. In terms of economic benefits, the procurement cost savings rate is 12%, customer satisfaction is increased by 18%, and the average loss avoided by risk warning is about 3 million yuan. (APA Huang, J., & Qiu, Y., 2025)

In the grain and oil industry, the system integrates well with the enterprise information system, with a response time of 1.1 second and a failure rate of less than 0.6%. The coverage rate of inventory management and supplier rating functions is 82%, with relatively high user frequency and positive feedback. The data collection accuracy is 96%, the data update timeliness is 89%, and the processing efficiency is high (Liu, Z., 2025). The user satisfaction survey shows that the interface friendliness score is 4.1/5, the operation convenience score is 4.0/5, and the overall satisfaction score is 4.3/5. In terms of economic benefits, the procurement cost savings rate is 10%, the inventory turnover rate is increased by 20%, and the average loss avoided by risk warning is about 2 million yuan. (Huang, T., Yi, J., Yu, P., & Xu, X., 2025)

4.3 Analysis of Factors Affecting Adaptability

There are significant differences in business processes, data characteristics, and risk management requirements across different industries, which affect the adaptability of the system. The real estate industry has long-term projects and large-scale capital flows, requiring strong project progress management and capital risk warning functions; the petrochemical industry has high requirements for the stability and safety of raw material supply, necessitating precise supply risk warning and logistics optimization functions. The system adapts to the needs of different industries by flexibly configuring functional modules and optimizing algorithms. The size and management level of enterprises also affect the adaptability of the system. Large-scale enterprises have complex information systems and strict data management, requiring higher integration degree and data processing capabilities of the system; small-and medium-sized enterprises focus on the system's ease of use and cost-effectiveness, which the system meets by simplifying operation procedures and offering flexible pricing. The technical environment and data foundation are key factors for the adaptability of the system. A good technical environment supports the efficient operation of the system, and a complete data foundation provides accurate analysis basis. Petrochemical industry enterprises have advanced information technology infrastructure and rich data resources, enabling the system to achieve precise risk warning and optimized decision-making; the hotel industry has relatively fewer data resources, and the system optimizes the data collection and processing procedures to provide effective supply chain management support.

5. Optimization and Improvement of the Supply Chain Intelligent Rating System

5.1 Analysis of System Optimization Needs

In practical applications, the system has exposed some issues. In terms of data collection, it is necessary to expand data sources, such as land transaction data in the real estate industry and crude oil price data in the petrochemical industry, to enrich the dimensions of data. Regarding the user experience of functional modules, some users have reported that the operation process is complex and that the interface design needs to be optimized to simplify the operation process. In terms of the real-time and accuracy of risk warning, there is a delay in the generation and push of warning signals in complex scenarios, and it is necessary to optimize the data processing algorithms. Moreover, the integration degree of the system with existing business processes of enterprises is insufficient, and the collected data and analysis results cannot be directly applied to actual business decision-making. It is necessary to strengthen the in-depth integration of the system with existing business processes of enterprises.

In terms of cross-industry adaptability, the general applicability of the system's functional modules is insufficient, and it is necessary to customize the development according to the characteristics of different industries. Data adaptability issues cannot be ignored either, as there are differences in data formats, update frequencies, and quality standards across different industries. It is necessary to optimize the data adaptation mechanism. In addition, users in different industries have different preferences for the use of system functions, and it is necessary to optimize the layout and priority settings of functional modules to provide personalized experiences.

5.2 Functional Optimization and Upgrade of the System

In response to the optimization needs, the system has improved its functional modules. The data collection module has added access interfaces for industry-specific data sources and optimized data collection algorithms to improve the accuracy and efficiency of data collection. The user interface module has redesigned the interface layout, simplified the operation process, and added intelligent prompt functions. The risk warning module has optimized data processing algorithms to increase the sensitivity to sudden risks and the real-time nature of warnings. At the same time, the system has strengthened its integration with existing enterprise information systems to achieve seamless data flow and automated support for business decision-making.

In terms of technical performance, the system has undergone comprehensive upgrades and optimizations. It has adopted a distributed computing architecture and containerization technology to improve the system's processing capabilities and scalability. The database design has been optimized, combining distributed

databases with in-memory databases to improve the efficiency and read-write speed of data storage. More advanced machine learning and artificial intelligence algorithms have been introduced to improve the accuracy and efficiency of data processing. At the same time, network security protection measures have been strengthened, and the user permission management mechanism has been optimized to ensure the security and confidentiality of data.

5.3 System Promotion and Application Strategies

To promote the widespread application of the system, the following promotion strategies have been formulated. In terms of market promotion, the system's visibility and influence will be increased through participating in industry exhibitions, holding technical seminars, and publishing promotional materials. In terms of channel cooperation, partnerships will be established with software developers, system integrators, and consulting firms to expand sales channels. In terms of customer relationship management, a comprehensive customer service system will be established to provide high-quality pre-sales, mid-sales, and after-sales services. In terms of policy support, efforts will be made to actively seek support from the government and industry associations, participate in the formulation of relevant standards and project applications, and reduce the usage costs for enterprises.

During the implementation of the system application, it is recommended that enterprises carry out sufficient publicity and training internally to improve employees' awareness and acceptance of the system. A phased implementation approach should be adopted, starting with pilot applications in key business departments or important projects to accumulate experience before gradually expanding. Communication and collaboration with suppliers should be strengthened to ensure their active cooperation in system data collection and rating work. Finally, a continuous improvement mechanism for the system should be established to regularly collect user feedback and market dynamics, and to adjust and optimize system functions in a timely manner according to the development of enterprises and changes in the industry. Through the above optimization and improvement measures, the supply chain intelligent rating system will further enhance its performance and adaptability in multiple industry applications, providing more efficient and accurate support for supply chain management for enterprises, and helping them to enhance competitiveness and economic benefits.

6. Conclusions and Future Outlook

6.1 Summary of Research Conclusions

The supply chain intelligent rating system has been widely applied in industries such as real estate, petrochemicals, hotels, and grain and oil, significantly improving supply chain management efficiency and benefits. The system has helped enterprises reduce costs and increase customer satisfaction through precise risk warning and optimized procurement decision-making. For example, the procurement cost in the real estate industry has been reduced by 8%, the logistics cost in the petrochemical industry has been reduced by 15%, the customer satisfaction in the hotel industry has been increased by 18%, and the inventory turnover rate in the grain and oil industry has been increased by 20%. The system has brought significant economic and management benefits to enterprises. The system has demonstrated good adaptability in multiple industries, with its technical and functional modules meeting the needs of different industries. The technical adaptability is high, with strong system integration and stability; the functional adaptability is good, with practical risk warning and decision-making support functions; and the data adaptability is excellent, with accurate and efficient data collection and processing. Despite differences, the system can meet the specific needs of each industry through optimization and adjustment, providing strong support for cross-field applications.

Table 3.

Industry	Economic Benefits
Real Estate	Procurement Costs Reduced by 8%
Petrochemical	Logistics Costs Reduced by 15%
Hotel	Specific Economic Benefits Not Mentioned
Grain and Oil	Inventory Turnover Rate Increased by 20%

6.2 Research Innovations and Contributions

This study is highly innovative. Firstly, it uses

big data and artificial intelligence technologies to realize real-time monitoring and precise warning of supply chain risks. Secondly, the system architecture is flexible and has cross-field adaptability. Thirdly, the data collection and processing procedures have been optimized to improve the accuracy and real-time nature of data. Fourthly, the user interface and the layout of functional modules have been optimized to enhance user experience and operational convenience. This study enriches the theoretical research in the intersection of information project management and supply chain management, providing a new perspective for the development of related theories. From a practical standpoint, it offers specific guidance for enterprises' digital transformation and supply chain optimization, helping them to enhance competitiveness. At the same time, it provides empirical support for the development and promotion of the supply chain intelligent rating system, promoting its application in more industries.

6.3 Research Limitations and Future Outlook

This study has some limitations. There is still room for expanding the data sources, as data acquisition in some industries is challenging. The degree of customization of functional modules needs to be further improved, especially in specific scenarios. The promotion of the system faces issues such as low enterprise acceptance and high implementation costs. Future research will focus on expanding data sources, deepening the customized development of functional modules, exploring effective promotion models, and strengthening cooperation between industry, academia, and research institutions to promote system technological innovation and application development, helping enterprises to enhance their supply chain management level and economic benefits.

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