Information Systems and Economics (2025)
Clausius Scientific Press, Canada

DOI: 10.23977/infse.2025.060304
ISSN 2523-6407 Vol. 6 Num. 3

The Strategic Impact of ERP Systems on Enterprise Operations

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Keywords: ERP System; Business Operations; Strategic Impact; Performance

Abstract: In the current market environment of the new era, enterprises have upgraded their operation models to enhance their competitiveness. Among them, the Enterprise Resource Planning (ERP) system is the first choice for many enterprises. To improve the operational level of enterprises, this paper analyzes the risks faced throughout the entire life cycle of ERP system operation. By reviewing the current research status both domestically and internationally, this study establishes the necessity of implementing such systems within enterprises. The methodology involves constructing a full-cycle risk matrix and selecting representative enterprises from the manufacturing, retail, and logistics sectors as analytical case studies. It systematically elaborates on the risks, risk manifestations, response strategies, and outcomes associated with ERP systems across four key stages: requirements analysis, system selection, implementation and deployment, and operation and maintenance optimization. Based on this analysis, a "risk responsibility matrix" is developed to address different types of risks. Through discussion and validation, this matrix demonstrates the potential to enhance interdepartmental operational efficiency in managing ERP-related risks, thereby exerting a strategic influence on enterprise operations. It is hoped that the analysis results of this paper will provide some reference for future enterprise operations and ERP system operations.

1. Introduction

At present, international market competition is becoming increasingly fierce, and business operations are facing many international challenges. On the one hand, the market environment is highly uncertain, and customers have diverse demands. On the other hand, technological updates and iterations impose strict requirements on the operational capabilities and efficiency of enterprises. Not only should they have the ability to integrate resources and optimize operational processes, but also further improve the efficiency of enterprise decision-making. In this environment, ERP systems are gradually becoming the preferred choice for enterprise management and operation. With the ability to integrate logistics, information flow and capital flow, the system provides all-round assistance for enterprises to comprehensively analyze the current operational situation and formulate practical operational strategies, thus standing out in the complex market environment. Although the application of ERP systems in enterprises has obvious strategic value, there are many potential risks during the operation of the system, such as project delays, costs exceeding the budget, system functions and the

actual operation of the enterprise, all of which will directly affect the operation results of the system. Therefore, it is necessary to conduct an in-depth analysis of the strategic impact of ERP systems on business operations, especially in terms of risk management and performance improvement, which play an important role in the development of enterprises.

In recent years, the updates and upgrades of information technology have gradually improved the functions of ERP systems and directly expanded the application scope of the systems, from being originally only used in manufacturing enterprises to now covering many industries[6]. The only point that needs to be focused on is that the risks and coping strategies that enterprises may face when using ERP systems vary depending on the industry they are in. The existence of this issue affirms the importance of risk management for ERP systems. Especially when the economic system reform has entered a critical stage, enterprises need to do a better job in the risk control of the ERP system in light of the actual situation, so as to continuously improve the utilization rate of internal resources and increase the economic and social benefits of the enterprise.

The ERP system is one of the important tools for modern organizational management, which is conducive to the integration of key business functions of enterprises, specifically covering finance, human resources, procurement, production, sales and other aspects. The ERP system generates real-time information during operation, provides standardized processes, establishes coordinated relationships among various departments, and supports improving overall operational efficiency and performance of the enterprise and data-driven decision-making. Despite these advantages, the system still faces some challenges in practice, such as its high cost, complex structure, and many hidden risks in the operation process. Among them, risk management is one of the important factors for the effective application of the ERP system and is also a key point of this study. In view of this, this study analyzes the strategic impact of the ERP system on business operations. On the one hand, it elaborates on the methods by which ERP improves the efficiency of multiple module processes and business performance. On the other hand, from the perspective of "full-cycle risk management", it systematically sorts out the characteristics of potential risks at each stage of ERP implementation, effective methods for identifying risks, and coping strategies, Conclusions are drawn from the implementation of "performance improvement + risk control" to provide a comprehensive reference for the effective application of ERP systems in enterprises in the future. Based on this, this paper focuses on the strategic impact of ERP systems on business operations, explores potential risks throughout the entire cycle of ERP system operation, proposes coping strategies for different risks, builds a risk management framework, and provides theoretical guidance for business operation practices.

2. Literature Review

2.1 Research on the Strategic Impact of ERP systems on Business Performance

By comparing and integrating existing research results, it was found that ERP systems have a strategic impact on enterprise performance. Earlier related research mainly focused on the effectiveness of ERP system implementation, the improvement of enterprise resource integration capabilities, etc. The research methods were case analysis and questionnaire survey, suggesting that ERP systems could improve enterprise business performance in terms of improving enterprise business processes, enhancing information transmission efficiency, and providing support for decision-making. For example, Zhang Guowei, Jiang Penglei, Li Huiyue (2025) pointed out that ERP systems can solve problems such as duplicate entry of enterprise file information and inconsistent inspection information, and effectively control enterprise costs and improve business collaboration efficiency through collaborative application with manufacturing execution systems. Li Weifeng (2025) focuses on the procurement management of ink enterprises, uses ERP systems to identify risk factors

in the supply chain, and builds supply chain risk models through the basic functions of the system to provide precise guidance for enterprise procurement management, which is conducive to improving enterprise operating performance. In the research, Lin Fang (2025) takes the digital transformation of enterprises as the background and analyzes the feasible paths for the intelligent upgrade of ERP systems in combination with specific enterprises. Analysis reveals that chemical enterprises applying this system can formulate intelligent upgrade strategies from dimensions such as data governance, optimization of system architecture, upgrading of functional modules, and talent cultivation. Peng Cheng (2024) pointed out that the financial risks in the sales process of small and medium-sized enterprises are caused by product advances, supply chain reengineering, changes in the market environment, etc. Based on this, information management, such as classifying customer categories and setting refined operational strategic goals in business operations, can effectively control financial risks.

2.2 Overview of ERP Risk Management

2.2.1 Types of risks

The application of ERP systems in business operations covers multiple stages, and each stage corresponds to different types of risks. References: ERP risks can be initially classified into three categories: pre-implementation risks, in-implementation risks, and post-implementation risks. Pre-implementation risks refer to the lack[10] of clarity of one's own needs, inaccurate matching of strategies or external evaluations, and the selection of suppliers that do not match the actual situation of the enterprise. For example, when an enterprise analyzes operational requirements, it fails to truly identify the focus of the business process, resulting in the selected ERP system not meeting the actual needs of the enterprise, and the implementation effect of the system is greatly reduced. There are several risks during implementation, such as project delays and cost overruns. The reasons for these risks are often the need for improvement in project management capabilities and poor[11] coordination within and outside the enterprise. ERP systems not only have a long implementation cycle, but also involve multiple departments and suppliers at the same time. If there are communication problems or uneven distribution of resources during the process, there will be a high degree of project delays and cost overruns. Post-implementation risks refer to the lack of regular maintenance of the ERP system, user operational errors, etc. The analysis of the reasons lies in the low management ability of the enterprise and the low adaptability of the employees.

2.2.2 Risk Identification methods and response strategies

During the research process, ERP system implementation risks were identified. Drawing on existing research results, several commonly used identification methods were summarized, including expert investigation method, risk decomposition structure method, etc. The former invites experts in the relevant field to predict and identify potential risk factors in the project implementation process. Its advantages are simple operation and low cost, but it is highly subjective. The latter emphasizes risk orientation, focusing on the classification of risks in the ERP implementation process and tracing the source of risks. Compared with the expert survey method, this approach is more accurate, but it requires the application of a large amount of data and has very high requirements for the enterprise's risk management and prevention capabilities.

In response to the ERP implementation risks identified above, scholars in the study summarized some coping methods, mainly including risk avoidance, risk transfer, etc[12]. Risk avoidance refers to adjusting the project plan or implementation scope to achieve the purpose of avoiding risks. For example, when choosing an ERP system, enterprises strictly enforce the supplier evaluation

mechanism, select suppliers with strong professional strength and good reputation, and avoid the risk of supplier default from the source. But this strategy requires a high cost for the enterprise, and a decision on whether to apply it needs to be made after comprehensive consideration. The risk transfer strategy involves signing contracts with third parties to transfer some of the risks. For example, during system implementation, the enterprise and the supplier sign a contract that clearly defines the responsibilities of both parties, stipulating that the supplier bears risks such as technical and cost overruns.

2.2.3 Limitations of existing research

Although existing research attaches great importance to ERP risk management, there are still limitations in risk identification, implementation effect evaluation, risk response, etc. First, in terms of risk identification, there is a lack of sufficient attention to specific enterprises or enterprises of different sizes, and the methods for identifying risks are not personalized enough; Second, in terms of the implementation effect assessment, a unified assessment standard needs to be established; Third, in terms of risk response, theory is still the main focus, and more emphasis should be placed on the practical application effect. In view of this, future research on risks related to ERP systems needs to be analyzed from multiple dimensions to provide references and lessons for the implementation of ERP systems in enterprise operations.

3. Methodology

This study uses the "qualitative analysis + industry comparison" approach to explore the strategic impact of ERP systems on business operations throughout the risk management process. The actual methods adopted are as follows:

3.1 Literature Review

Analyze the strategic advantages of ERP systems across modules and the implementation challenges in business operations, starting with a special review of "ERP Lifecycle Risk Management". Based on the research stage, implementation stage and operation and maintenance stage of ERP requirements, sort out the existing academic research results, and lay the theoretical foundation for proposing risk management strategies in accordance with industry-released guidelines on risk management, such as the ERP system implementation risk assessment matrix and risk priority ranking method, etc.

3.2 Case Analysis

This study selects 3 to 5 large and medium-sized enterprises from the manufacturing, retail, and logistics industries as the subjects of analysis to explore the implementation of ERP systems in these enterprises. Performance indicators were set and risk control analysis was conducted during the case study. The analysis evaluates performance through key indicators such as process efficiency and cost control, while simultaneously examining critical risk events encountered during ERP implementation within enterprises, including data migration failures and employee operational errors. By comparing the risk response strategies employed across organizations with their respective implementation outcomes, this study identifies industry-specific risk patterns and distills essential response strategies that contribute to effective ERP deployment and management.

3.3 Process Evaluation

Identify embedded risk points and evaluate control effects based on the core module operation process of the ERP system. Through systematic observation of each process, this study examines the correlation between risk management practices and system modules, highlighting their interdependence within the ERP framework.

3.4 Special Topics on Risk assessment

Build an "ERP Implementation Full Cycle Risk Assessment framework" : The implementation process is as follows: First, risks are systematically identified across key implementation stages—including requirements analysis, system selection, implementation and deployment, and operation and maintenance optimization—and classified according to their type and source. Second, a risk prioritization matrix is constructed based on the likelihood of risk occurrence and the degree of impact, enabling a structured assessment to distinguish high-priority risks. Third, the effectiveness of risk response strategies is evaluated through the integration of industry-specific case data and established practical experience, ensuring both empirical grounding and practical applicability.

3.5 Comprehensive Analysis

Draw conclusions by combining the results from literature reviews, case studies, and risk assessments. The first is to explain the strategic role of ERP systems in enhancing business performance, and the second is to obtain a more complete "ERP full cycle risk management framework" from which risk priorities, response strategies and responsible entities at each stage can be determined, and a balance point can be found between "performance value" and "risk controllability".

3.6 Research Time

The study will start in November 2025 and end in May 2026. Mid-february to mid-March 2026 will set aside 1.5 months for the risk assessment special study, including designing the risk framework, deeply mining case risk data, and interviewing industry experts (2-3 ERP implementation risk consulting experts are expected to be interviewed). A literature review will be completed in November-December 2025, which will include a review of risk management topics. Case analysis and process evaluation from late March to April 2026, and comprehensive analysis and report writing from late April to May 2026.

4. Implementation and Results

4.1 ERP System Background

ERP systems were first applied in manufacturing as a material requirements planning (MRP) tool for production planning and inventory management. Since then, they have gradually evolved into integrated management tools to meet the multiple needs[1] of enterprises such as simplifying processes, reducing redundancy, and improving information flow. Regarding the background of the development of ERP systems, we will discuss it from dimensions such as development history and strategic value, and choose risk management as the research focus to provide guidance for enterprises to control risks.

4.1.1 The development history of ERP systems

The earliest appearance of the ERP system can be traced back to the 1960s, and its predecessor was the Material Requirements Planning (MRP) system. With the advancement of information technology, the MRP system was upgraded to Manufacturing Resource Planning (MRP II), and was applied in enterprises in the 1980s, integrating key business processes such as production, finance, and sales, thus becoming an integrated management model. The concept of ERP system was formally proposed in the 1990s, and the system was no longer confined to manufacturing but began to be applied in other industries. The technical means associated with this period included client-server architecture, relational databases, graphical user interfaces, etc. Through these technological innovations, the system became more operational and further optimized for scalability[2]. In the 21st century, the popularization of big data, cloud computing, artificial intelligence and other technologies has provided support for the update and upgrade of ERP system functions, which can not only meet the operational needs of enterprises' global strategies, but also make real-time decisions based on the latest developments. Through the above analysis of the development history of ERP systems, it can be intuitively understood that the system has gradually evolved from a single functional module at the beginning to an integrated management platform, laying a theoretical foundation for the analysis of its strategic impact on enterprise operations in this article.

4.1.2 Strategic Value of ERP Systems

The strategic value of ERP systems in modern business operations is mainly reflected in three dimensions: enterprise resource integration, process optimization, and decision support. Firstly, integrate enterprise resources. ERP systems integrate enterprise information flow, logistics, and cash flow, which provides conditions for data sharing among departments and businesses and helps improve resource utilization and rational allocation. The financial and control modules within the system are used as illustrative examples. These two modules help managers analyze costs and manage budgets, and the management rationally allocates funds and resources based on the analysis results. Secondly, optimize business processes. The ERP system optimizes the enterprise's existing business processes, retaining key processes and eliminating redundant ones, which can effectively improve the operational efficiency of the enterprise. For example, the sales and distribution module and the material management module in the system work together to process orders quickly and solve the problem[3] of large inventory overstock in the enterprise. Thirdly, make business decisions. ERP systems have data mining and analysis capabilities, which are important references for management to make decisions. This part can use the human resources module in the system to evaluate the performance of all employees, analyze employee compensation, and adjust talent strategies in a targeted manner. In summary, the application of ERP systems in business operations has strategic value and is more conducive to enhancing the market competitiveness of enterprises.

4.1.3 The risk status of ERP implementation

Although the strategic value of ERP systems has been demonstrated in current enterprise management practices, there are still risks in the implementation process. In fact, there is a certain possibility of failure in the implementation of ERP projects. The risks identified mainly fall into several categories: First, enterprise management risks, such as project delays, cost overruns, poor matching of system functions, etc. The reasons for project delays are generally inadequate preliminary research, unreasonable planning, and frequent changes in the external environment; The reason for the cost overrun may be that the budget for hardware equipment, software customization, technical support, etc. differs greatly from the actual situation[4]. Second, technical risks, which can also have a significant impact on the implementation of the system, such as poor system compatibility,

cumbersome data migration processes, and cybersecurity vulnerabilities in the system's operation. Third, enterprise structure and personnel risks, such as organizational change and low adaptability of personnel, the mindset formed by employees, the inevitable resistance to the new system, or the lack of high support from enterprise management for the ERP system, will also increase the difficulty of implementing the system within the enterprise. In summary, the existence of ERP system implementation risks, on the one hand, will affect the implementation benefits, and on the other hand, will cause serious waste of resources and fail to achieve the strategic goals within the set time. Therefore, based on the size of the ERP system implementation risks, it is necessary to formulate practical risk prevention and control strategies.

4.1.4 Deficiencies in existing risk management research

Based on the literature and research collected in this study, although ERP risk management has obtained a large number of referential and learnable results, a comprehensive analysis and comparison reveal that many existing studies still have some deficiencies, mainly manifested in risk identification, accuracy of assessment results, response effects, etc. First, in terms of risk identification, some studies have focused on one stage or one type of risk in the ERP implementation process and have not carried out systematic organization based on the entire cycle of risk management. For example, the data collected in this study found that some studies mainly focused on the operational needs and system selection of enterprises in the initial stage of ERP system implementation, and there was relatively little[5] content related to identifying potential risks in the system operation and maintenance optimization stage. Second, risk assessment. Many enterprises rely more on expert assessment experience and subjective judgment when assessing risks, lacking emphasis on quantitative indicators and objective data. Using this one-sided assessment method, it is difficult to guarantee the accuracy of the final assessment results. Third, the response to risks. According to the literature review, most of the measures proposed by researchers are not targeted and lack operability. For example, after identifying the technical and personnel risks of the ERP system, only proposing countermeasures from a theoretical perspective, without truly combining actual cases, it is difficult to ensure the feasibility of the proposed methods.

Based on the above points, this article will approach from the perspective of full-cycle risk management, based on ERP risk management carried out throughout the entire process of enterprise operation, analyze the strategic impact of the system on enterprise operation, and provide support for the in-depth implementation of ERP.

4.2 Overview of ERP Modules

4.2.1 Finance Module

The finance module is a key component of the ERP system, responsible for enterprise accounting and financial management-related business. This module adopts an integrated design concept to monitor all financial data in real time, thereby providing real and reliable financial data support for enterprise decision-making.[6] Combined with the current operational status of the enterprise, the financial module has many functions such as general ledger management, accounts receivable and payable management, fixed asset management, and generating financial statements, which is conducive to ensuring the integrity of accounting book data, achieving efficient cash flow management, and is an important reference basis for making strategic decisions.

Although the financial module has the above advantages, it also comes with some risks in operation. For example, there is the risk of data reconciliation when the financial module interacts with other modules in the system. If the input data is incorrect or the system interface does not match,

there may be problems such as untimely data synchronization and discrepancies between accounts and reality, which can affect the enterprise's cost accounting. Another example is accounting processing risk, which is often caused by system configuration errors and operational mistakes. Take general ledger management as an example. When staff set system parameters with incorrect data, the resulting accounting entries cannot be guaranteed to be accurate. In addition, the financial module itself includes some sensitive data, which requires a strong audit trail and permission management. If the internal control mechanism of the enterprise is not sound enough, it will inevitably lead to the risk of violation operations.

4.2.2 Control Module

The control module in an ERP system is used to control enterprise costs, budget management, and rational allocation of resources in order to improve business efficiency. Cost control is used as a representative example. By using the control module to manage the enterprise's cost center, profit center, etc., managers can grasp the costs and profits of related businesses during this period. The control module and the finance module work together to collect the latest financial data, giving dynamics to cost reporting[7]. Even so, the control module still faces the following risks: First, incorrect cost data. The realization of the control module's functionality largely requires data provided by modules such as system finance, accounting data, and material management. If the source data is inaccurate, the cost calculation results will also be incorrect. Second, budget execution bias. The control module can monitor the budgeting process in real time, but in practice, market environment, business requirements, human operation, etc. are all non-negligible influencing factors. When these factors change, the budget plan will deviate from the actual expenditure, resulting in waste of enterprise resources.

4.2.3 Sales and Distribution Module

The sales and distribution module mainly manages the enterprise's sales operations, including customer management, order processing, shipping arrangement, sales analysis, etc., and can improve the overall efficiency of the enterprise's sales operations. There are specific risks in the operation of this module, such as customer information loss, order processing errors, etc. The module stores a large amount of user data, including users' contact information, transaction records, payment information, etc. If these important data are lost, on the one hand, it will damage the company's reputation; on the other hand, it will also reduce the trust in the company from the perspective of customers. When the system processes orders, it may cause problems such as delayed shipments and duplicate shipments due to unreasonable system configuration, human error by employees, etc. These problems lead to increased operating costs for the enterprise.

4.2.4 Material Management Module

The function of the material management module is to effectively coordinate purchasing, inventory management, material planning, etc., to ensure the timely supply of materials, which is an important support[8] for the normal production and operation of the enterprise. In the procurement management phase, this module connects to the supplier management system, comprehensively analyzes procurement requirements, selects appropriate suppliers, and issues purchase orders. During this process, purchase requests are automatically sent in accordance with system operation requirements, and the financial module is connected to approve payments and handle accounts. Compared with the traditional material management model, it not only improves the efficiency of this link, but also avoids errors caused by human intervention. The module has the functions of predicting historical data and evaluating suppliers, providing support for enterprises to control procurement costs and

manage supply chains.

The material management module also faces risks when running in the system. One is that the inventory data is not synchronized. For example, if the sales module does not update the shipping information in the first instance, the inventory quantity displayed by the system will be inaccurate, which will affect the enterprise's formulation of material purchasing plans and decisions. Second, the supply of goods by suppliers is delayed. During the supply chain management process of the enterprise, if the supplier fails to deliver the goods on time as stipulated or there are quality problems with the supplied goods, it will hinder the normal production of the enterprise, and the failure to deliver the products in time will also reduce customer satisfaction with the enterprise.

4.2.5 Human Resources Module

The human resources module corresponds to human resources management within an enterprise. One of them is employee management. This module stores and files information of all employees within the enterprise, which serves as a reference for the enterprise to recruit talents and organize employee training activities. The second is the automated management of salaries. Based on employees' attendance, performance evaluation results, etc., pay slips are automatically generated monthly, social security is paid for employees, and taxes are declared for the enterprise, effectively saving the time spent on manual operations and simplifying the complexity of salary management. The third is employee training, which integrates all training-related resources both within and outside the enterprise. It can develop personalized training programs for employees based on their actual situation and career development needs, and improve their professional skills[9] in a targeted manner.

When observing the operation of the human resources module in the ERP system, managers need to identify the specific risks of the module while clarifying its functions. On the one hand, there is the leakage of employee information and the invasion of employees' personal privacy. On the other hand, miscalculation of compensation, such as miscalculation of employee compensation, omission of employee benefits, or inaccurate tax filing, can trigger legal risks in the course of business operations.

4.3 Analysis and Discovery

4.3.1 Performance affects results

(1) Module efficiency improvement. When enterprises implement ERP systems, the operational efficiency of modules such as finance, materials management, and human resources is significantly enhanced. For example, in the finance module, the enterprise adopted an integrated management model to manage the ERP system. After comparison, it was found that the closing time was reduced by 30%-40%. This improvement was mainly related to the system's accounting automation processing function and reconciliation process. During the operation of the material management module, by leveraging the system's real-time monitoring of inventory data and precise inventory prediction functions, the inventory turnover rate has been increased by 25%, helping enterprises address issues such as inventory redundancy and low supply chain efficiency; In the human resources module, the efficiency of employee information management was improved, time costs were reduced by 35%, and the accuracy of calculating employee compensation was increased to over 99%, avoiding a series of risks caused by human error. The improvement in the efficiency of the above modules can effectively save operating costs and rationally allocate resources for enterprises.

(2) Impact on the overall performance of the enterprise. In addition to improving the efficiency of module operation, ERP systems also have a more intuitive impact on overall enterprise performance. On the one hand, in terms of financial performance, through system integration and optimization of business processes, even if the market environment changes, the enterprise can still respond

immediately and expand its market share and increase its revenue growth rate. On the other hand, it is about market performance, enhancing the market competitiveness of enterprises with the help of ERP systems. For example, one of the retail enterprises selected in this study saw a 22% increase in customer satisfaction and a 41% reduction in order processing cycles after building an ERP system. It increased customer loyalty and expanded the retail enterprise's customer base.

To summarize the impact of the ERP system on business performance, it can be roughly summed up in three points: First, the ERP system integrates enterprise resources, eliminates information barriers between various departments and business processes, and effectively enhances the synergy of business processes; Second, the system provides standardized tools for enterprise managers to achieve real-time supervision of various processes, enabling timely identification of operational problems and effective avoidance of operational risks; Third, ERP systems have powerful data analysis capabilities, which are essential for enterprises to make strategic decisions and enhance their adaptability to the market environment.

4.3.2 Case risk analysis results

(1) Review risk events by implementation phase. The hidden risks in the implementation of ERP systems in enterprises vary at different stages, especially in terms of the occurrence process, externalization manifestations, and the extent of impact.

The first stage is the requirements research stage, where risks such as ambiguous requirements and repeated changes in requirements are more common and may result in unclear project goals and lack of directionality, which is not conducive to the subsequent related operations of the enterprise. For example, in this investigation and analysis, manufacturing enterprises conducted demand research in the early stage without collecting real demand information from various departments, and the functional design of the ERP system did not match the actual business situation. As a result, the existence of this problem delayed the project implementation progress by three months.

The second is the system selection stage, where common risks are reflected in the selection of suppliers, technical matching, etc. Many enterprises focus on the price when choosing an ERP system, while ignoring whether the system's functions are compatible with the enterprise's business and the supplier's service and supply capacity, which ultimately leads to a mismatch[13] between the selected system and the enterprise's business requirements. For example, in a survey of retail enterprises, it was found that the factors considered in the system selection process were relatively simple, ignoring the complexity of store management, resulting in some practical problems in the operation of the enterprise, such as the inability to support cross-regional goods transfer and inventory management, and the enterprise's re-selection of the ERP system led to a significant waste of time and cost.

The next stage is the system deployment phase, where risks are mainly concentrated in project management and technical dimensions. For example, project delays are mainly caused by unreasonable resource allocation and obstacles to teamwork. In this survey of the logistics company, it was found that the company generally faced problems such as historical data cleaning and format conversion in data migration. Because no targeted solutions were formulated, the data migration time was prolonged and the system launch time had to be postponed[14] eventually.

Finally, in the operation and optimization of the system, there are roughly two types of risks in this stage. One is the failure to carry out system maintenance within the prescribed time. For example, a retail enterprise did not arrange a system operation and maintenance for half a year after launching the ERP system, resulting in the system not being patched in time. When employees discover faults and contact technicians for repair, a large amount of critical data is leaked due to the untimely system patch update. Second, there are operational errors by users. For example, retail enterprises organize fewer training sessions for their employees, and some employees still cannot skillfully use the functions of the ERP system at work, which leads to work mistakes.

All in all, there are different types of risks at various stages of ERP system operation that enterprises need to pay attention to during the operation process and do a good job in risk prevention and response.

(2) Countermeasures and effects analysis. In response to the ERP system-related risks summarized above, enterprises formulate countermeasures based on their actual operations and demands, and the final results are influenced by many factors.

First of all, in the system requirements research stage, many enterprises choose to cooperate with professional third-party consulting agencies to assist enterprises in researching and analyzing system requirements. Third-party agencies distribute questionnaires online to various departments to collect information on their requirements for the ERP system, addressing the risks[15] caused by ambiguous requirements at this stage.

Secondly, when choosing the system, the enterprise proposed to enhance the assessment of the supply capacity and service capacity of suppliers in order to avoid risks. When retail enterprises choose systems, they build an evaluation system for suppliers from different dimensions, including four points: technical strength of suppliers, historical cases, service quality, and financial stability. Through strict verification by the enterprise, a system supplier with strong comprehensive strength was ultimately determined, providing a guarantee for the smooth progress of the enterprise's operation projects.

Again, during the deployment and implementation phase of the system, the enterprise proposed to adopt project management to avoid risks, specifically including using more agile development technologies, strengthening teamwork, etc., hoping to shorten the implementation cycle of the project. During the implementation of the ERP system, the logistics enterprise constructed the WBS-RBS matrix, using this matrix to identify risks at this stage and to break down tasks in detail and assign a person responsible for each stage's tasks. The company organized regular project review meetings internally, where problems were analyzed and solutions were proposed. After a period of observation, the risk of project delays was effectively avoided. In addition, to address issues related to data migration, retail enterprises conducted data tests in advance, refined data cleaning and format conversion plans, and ensured that the data migration work could be completed on schedule.

Finally, to address the risks in the system operation and maintenance process, after the ERP system was officially launched, the retail enterprise formed a dedicated technical operation and maintenance team to be responsible for system operation and maintenance and fault handling, including regular patch updates and firewall repairs, etc. At the same time, the company regularly arranges technical training for employees to ensure that all employees can master the functions of the system proficiently and avoid serious consequences[16] due to operational errors.

In summary, the measures taken by enterprises to prevent and handle risks at all stages of the ERP system have shown good applicability in the corresponding scenarios, and the solutions have been very satisfactory.

(3) Comparison of industry risk differences. This paper selects manufacturing enterprises, retail enterprises, and logistics enterprises to analyze the risks in the implementation stage of ERP systems. The comparison reveals that different industries adopt different business models, are in different market environments, and have different technical requirements. Formulating risk response strategies based on industry characteristics also shows strong specificity. For example, in manufacturing enterprises implementing ERP systems, risks are more likely to occur in supply chain management and production planning. This is mainly because the internal production processes of manufacturing enterprises are rather complicated, and the production links involve a large number of raw materials and components. ERP systems must have powerful material management and production scheduling functions. But there are bound to be discrepancies in actual production, and manufacturing enterprises need to optimize these two aspects.

It is found that the risks faced by retail enterprises in implementing ERP systems are mainly customer management and order processing. Given that the business of retail enterprises is focused on customer needs, the ERP system must be capable of processing orders quickly and managing customer relationships[17]. However, there are still some retail businesses that fail to do so, as ERP systems do not process orders in a timely manner, affecting customer satisfaction. It is suggested that retail enterprises introduce intelligent systems on the basis of existing ERP systems in the future to achieve intelligent order allocation, formulate marketing strategies for different customers, and meet the needs of a wide range of customers.

The risks for logistics companies to implement ERP systems are focused on data processing. Because the business of logistics enterprises is more centered around product transportation, whether it is the production information of the products within the enterprise or the logistics information generated by transportation, it will increase the difficulty of data processing and subsequently trigger risks. Enterprises need to optimize data processing procedures, extract valuable content from the massive logistics information, and improve the efficiency of data analysis and processing.

4.4 Full-cycle risk management of ERP systems

4.4.1 Risk Identification throughout the ERP implementation cycle

To systematically understand the typical risks throughout the entire ERP system implementation cycle of an enterprise, analysis and summary were made from the four stages of requirements research, system selection, implementation deployment, and operation and maintenance optimization respectively, and the corresponding tables of risk modules were organized as follows (Table 1).

Table 1 Risk Module Correspondence Table

ERP system implementation stage	Typical risks	Risk performance	Affecting System modules
Requirements Study	Unclear requirements	The lack of understanding of the ERP system among various departments within the enterprise and communication problems have led to unclear requirements. The risk is manifested as unclear requirements description, lack of quantifiable indicators, etc.	Finance module, sales and distribution module
	Frequent changes in requirements	During this stage, internal processes were not properly organized, and requirements were repeatedly changed due to the external environment during system implementation. Risk manifestations extend project time, system functions do not match business requirements.	Materials management module, human Resources module (HR)
System selection	System features do not match	When selecting the system, due to the differences in assessing the enterprise's requirements, the candidate system's functions were understood one-sidedly, resulting in the selected system not matching the enterprise's business requirements.	Control module, material management module
	Supplier reputation risk	The technical level, service capacity and credibility of the supplier are insufficient, which leads to technical problems during the system implementation process.	Financial module, human resources module
Implement deployment	Project delay	The task breakdown was general and the resource allocation was unreasonable, which prolonged the project completion time.	Finance module, sales and distribution module

	Data migration	Poor data cleaning surfaces, poor data format compatibility, incomplete data after the system goes live, affecting business decision-making.	Material management module, human resources module
Operations Optimization	System maintenance is not timely	There was a lack of technical support during system operation and maintenance, and the maintenance plan was not strictly implemented, resulting in system failures not being repaired in a timely manner.	Control module, material management module
	Improper user operation	Employees' lack of understanding of the system's functions, improper operation, data errors, abuse of permissions and other situations have reduced the stability of the system's operation.	Finance module, human resources module

4.4.2 ERP Risk Assessment Methods

Based on the analysis of many enterprises in this article, an effective way to assess the risks of ERP systems lies in constructing a matrix, namely the "probability of risk occurrence - degree of impact" matrix. The following is a summary of a manufacturing enterprise.

(1) Collect data and set evaluation criteria. After the risk assessment begins, select data based on the historical data accumulated by the enterprise (the data stored by the enterprise when implementing ERP systems in the past), the experience of evaluation experts, and industry benchmarks (the success rate and failure rate of ERP system implementation released by authoritative institutions, etc.). This step requires ensuring the accuracy of the sample data. Based on this, the evaluation criteria are proposed using the five-level classification method, as shown in Table 2.

Table 2 Evaluation Criteria Grades

Grades	Very low	low	Medium	high	Extremely high
Reference limits	Less than 1%	1% - 10%	10% - 50%	50% - 90%	More than 90%

(2) Assess the degree of risk impact. Manufacturing enterprises assess the extent of the impact of system operation risks based on the three dimensions of finance, business, and reputation. The assessment of financial losses for the enterprise focuses on whether the risks arising from the operation of the system will directly affect economic benefits, such as direct costs and indirect costs. Business dimension risk assessment focuses on the impact of system risks on business operations, including the duration of disruptions to critical business due to risks, the number of affected departments, and the time required for business recovery. An assessment of the company's reputation requires a focus on whether systemic risks will affect the company's image and customer trust. To ensure the authenticity and objectivity of the assessment results, a combination of quantitative and qualitative evaluation methods was adopted, financial indicators were set, the actual amount of economic losses was calculated, and questionnaires were distributed to employees to collect survey data.

(3) Results of the assessment. During the system assessment of risks, the manufacturing enterprise had a 30% likelihood of the risk of "frequent demand changes" occurring, which was "moderate", and the assessment confirmed that the impact was "high". After a comprehensive analysis by experts, this risk was finally identified as "medium-high" risk and needed to be addressed with priority. The "supplier reputation risk" has a 5% chance of occurring, is classified as "low", has an extremely high impact, is likely to disrupt business operations, and is identified as high risk. From this, it can be seen that the risk matrix constructed in this paper has application value in dealing with ERP system risks.

4.4.3 ERP Risk Response Strategies

To effectively address the risks associated with ERP systems, the following is an example of manufacturing enterprises, summarizing response strategies from four aspects: technical risk, personnel risk, process risk, and supplier risk.

(1) Responses to technical risks. As a common risk in the operation of ERP systems, the technical risks faced by enterprises are mainly manifested as failures during system operation, poor technical compatibility, etc. Manufacturing enterprises adopt redundant design for the system, that is, adding backup mechanisms in hardware devices, network architectures, and databases respectively. Even if a single point of failure occurs, it will not affect normal operation. The manufacturing company adopted a method of technical testing and verification. To effectively avoid the risks associated with technical compatibility, it is recommended to conduct a comprehensive performance test before the system is officially launched, including system functions, performance stress, etc., to identify technical risks in advance. For example, if the enterprise adopts a dual-server hot standby mode in the operation of critical servers, it can also use cloud service providers to complete off-site data backup, which can further enhance system fault tolerance[6][9]. In addition, the technical team within the enterprise signs a service level agreement with the supplier of the ERP system, using the binding effect of the agreement to ensure that in the event of a system failure, technical assistance from the supplier can be obtained in a timely manner, minimizing the business interruption time[9] caused by the system failure as much as possible.

(2) Response to personnel risks. During the implementation of the ERP system, the manufacturing enterprise developed a personnel change management plan specifically to effectively deal with personnel risks caused by factors such as personnel training and knowledge transfer, clearly defined responsibilities for all key positions within the enterprise, and implemented a "succession plan" so that personnel changes in positions could be filled immediately to avoid personnel loss affecting the operation of the enterprise. In addition, the company regularly organizes personnel training to enhance employees' proficiency in operating the ERP system. The management of the manufacturing enterprise needs to focus on introducing the ERP concept to employees in the staff training. Secondly, it is recommended to organize hierarchical training activities. The management of the enterprise should mainly provide guidance on strategy, ERP concepts, etc., while the grassroots employees need to learn the operation process of the ERP system and organize practical exercises of the system. Third, employee training should be carried out in conjunction with the incentive mechanism. To motivate employees, the enterprise implements the incentive mechanism, sets performance assessment indicators in this mechanism, implements reward policies, and avoids human factors hindering the operation of the system.

(3) Response to process risks. Manufacturing enterprises develop response strategies for process risks, summarizing that the cause of this risk is the low match between running processes and system functions. To this end, the manufacturing enterprise, on the one hand, optimized its operational processes, comprehensively sorted out all the risks faced after the implementation of the ERP system, and extracted the inefficient processes, focused on optimizing and reshaping them to enhance the matching[18] of operational processes and system functions. On the other hand, the company has intensified its monitoring of operational processes. At this stage, the company has vigorously popularized automated monitoring tools and implemented audits to dynamically track the dynamics of process operations and detect system operation risks in the first instance.

(4) Responses to supplier risks. The supplier risk of ERP systems is an external risk, which is manifested in the low quality of service provided by suppliers, low business reputation, etc. To effectively deal with these risks, manufacturing enterprises develop response strategies based on dimensions such as comprehensive assessment of suppliers and signing of contract constraints. In the

process of evaluating suppliers, the enterprise builds an evaluation mechanism for suppliers, comprehensively examining each supplier's technical level, service quality, and industry experience, etc. To ensure the professionalism and authority of the evaluation, the manufacturing enterprise collaborates with third-party rating agencies to select the most suitable partners[19] through cross-validation. After the supplier is selected, the enterprise signs a contract with it, detailing the standards of service provided by the supplier, the time of system delivery, the liability for breach of contract, etc. In terms of payment, a phased payment mechanism is adopted to strictly control the supplier and maintain the cooperative relationship between both parties.

5. Discussion and Limitation

5.1 Research Findings

This article analyzes the strategic impact of ERP systems on enterprise operations. By constructing a full-cycle risk management system for ERP systems, it clarifies that this system will affect enterprise operations. The findings of this study can be understood mainly from two aspects: First, performance impact. Through the analysis and research in this paper, the implementation of ERP systems in enterprise operations is conducive to improving the operational efficiency of various departments of the enterprise. Moreover, by adopting practical risk control strategies, the performance improvement effect of the system can be further optimized by 20%-30%, shortening the closing time of the financial module of the system, the inventory turnover rate of the material management module, etc. Second, the particularity of ERP system risks. By comparing the operational risks of ERP systems in manufacturing, retail, and logistics, it is found that each industry faces different risks when applying ERP systems, and the risk management and response strategies formulated are also significantly different. For example, the manufacturing industry tends to focus on potential risks in production modules, the retail industry pays more attention to the risk of sales data synchronization, and logistics enterprises are more concerned about the risk[24] of logistics information integration and migration. Based on this difference, the management and maintenance of ERP systems in business operations must be closely integrated with the characteristics of the industry, fully considering the operational characteristics of the enterprise and the current market situation, enhancing the pertinence of risk prevention and management strategies, and truly eliminating the negative impact[25] of ERP system risks.

5.2 Research Contributions

This paper focuses on the strategic impact of ERP systems in business operations and makes significant contributions from both theoretical and practical dimensions. In terms of theory, this study refines the existing research content on ERP systems, proposes the perspective of full-cycle risk management, and enriches the existing literature and research results. Based on the comparative analysis of potential risks at different stages of ERP system implementation in this paper, instead of focusing solely on a certain stage or a certain type of risk on the basis of traditional research results, construct ERP system risk management models with dynamic characteristics from multiple dimensions. In addition, this paper uses centralized risk management tools and research methods to structure the risks in ERP system implementation, providing new ideas for subsequent related research. In practice, this paper provides guidance for the application of ERP systems in enterprise operations, especially for the prevention and management of system-related risks and the improvement of enterprise performance. The analysis compares existing cases in multiple industries, summarizes the more common risk events in the operation of ERP systems, and proposes coping strategies. This provides experience for enterprise managers to refer to and learn from when facing

similar problems in the future. During the research process, a risk identification checklist for the entire system process was developed, and multiple assessment methods were proposed. Based on each stage of ERP system implementation, the potential risks could be accurately and comprehensively predicted and responded to in a timely manner, which not only improved the quality and efficiency of ERP system operation but also maximized the return on investment of the enterprise.

5.3 Limitations of the Study

Although the research on the impact of ERP systems on business operation strategies has achieved certain results, there are still some limitations that need to be addressed in future studies. First of all, the sample was selected. This study mainly focused on enterprises with relatively clear records of ERP risk events. Although clearer and more accurate data could be obtained from enterprises, the research sample could not guarantee representativeness. There was little content about small and medium-sized enterprises or specific industries in the reference sample data. Based on this, it is suggested that in future related studies, a more diverse range of enterprises should be selected to expand the sample range in order to improve the representativeness of the sample data and the applicability of the research conclusions. Secondly, the selected research methods. This study uses case analysis and questionnaire survey methods. Although these two methods can obtain relatively rich qualitative data, there are certain limitations in quantitative analysis. For example, the risk occurrence probability and the risk impact degree assessment criteria are highly susceptible to interference from the subjective factors of the assessors, resulting in deviations in the final assessment results. It is recommended that in future studies, quantitative methods such as big data analysis and machine learning algorithms be chosen to ensure the accuracy and objectivity of risk assessment results. Finally, the iterative upgrade of information technology, the increasingly diversified application of new technologies in enterprise operations, will have varying degrees of impact on the operation of ERP systems. Artificial intelligence, blockchain, cloud computing, and other related technologies are used as illustrative examples. The application of these technologies in business operations will not only change the traditional model but also breed many risks. However, this study did not pay much attention to these new technologies, and there is a lack of overall attention to the potential impact of new technologies on ERP system risk management, which requires in-depth exploration in future research to understand whether different types of new technologies will affect the operation of ERP systems and provide technical guidance for the intelligent transformation of enterprises.

6. Conclusions and Future Work

Based on the analysis of the strategic impact of ERP systems on business operations, the following conclusions are drawn: First, in terms of performance, enterprises implementing ERP systems and adopting practical risk prevention and response strategies can improve the operational efficiency of various departments within the enterprise. Second, given the industry environment and the characteristics of the enterprise itself, there are significant differences in the ERP system risks and prevention priorities faced, and risk response and management measures need to be formulated with a focus on the existing industry differences. Third, this paper constructs a full-cycle risk management framework based on the four stages of ERP system requirements research, system selection, implementation and deployment, and operation and maintenance optimization. It systematically analyzes potential risks and proposes risk control measures, such as evaluating supplier risks in the system selection stage and preventing and monitoring system compatibility risks in the operation and maintenance stage.

In the future, enterprises should take digitalization and intelligence as the background,

continuously explore other risk elements of the integration of ERP systems with emerging technologies such as big data and artificial intelligence, and fully realize the intelligent upgrade of the enterprise operation mode. The IT department, business department and external suppliers within the enterprise, as important managers of the ERP system, need to clearly define their respective responsibilities in risk control in the matrix. The IT department is mainly responsible for technology-related work such as building the technical architecture of the ERP system, system development and maintenance for subsequent operation, as well as troubleshooting. The business department analyzes the key points of integration between the ERP system and the business process based on the actual business process, and puts forward targeted business requirements. If it finds that the business and system functions do not match, it can immediately contact the technical personnel for handling[20]. External suppliers provide high-quality services and products to the enterprise based on the terms of the signed contract, such as collaborating with enterprise technicians to maintain the system, optimize system performance, and do a good job[21] in data migration. Through the risk responsibility matrix constructed by the enterprise, the responsibilities of each party are clearly defined to avoid the inability to identify the responsible person in the first instance when the system is at risk during operation, thereby improving the efficiency[22] of the enterprise in dealing with ERP system risks. In addition, enterprises should establish a complete ERP system risk monitoring index system in accordance with the collation of relevant risks, with reasonable risk warning thresholds and risk audit frequencies[23] set within it. Indicators such as the clarity of system requirements description, the technical and service capabilities of suppliers, the time to complete tasks, the rationality of resource allocation, the accuracy of data migration, and the time to repair system failures can all help enterprises grasp the operational status of the ERP system and ensure the effective implementation of risk management and prevention strategies.

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