

Research and Implementation of Enterprise Intelligent Operation and Management System

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Abstract: With the deepening of digital transformation, enterprise intelligent operation and management systems have become critical tools for enhancing management efficiency and optimizing resource allocation. This paper analyzes the necessity of constructing such systems from the perspectives of industry background and enterprise realities. By combining practical cases and data, it elaborates on the system's design framework and functional implementation. The system design covers three core modules: basic data acquisition, in-system data application, and cross-system data application, including functions such as customer/supplier management, project management, contract management, internal operations, plan management, and executive dashboards. Through functional demonstrations, this paper further illustrates the practical application value of intelligent operation and management systems in enterprise operations. The study shows that these systems can significantly improve operational efficiency and decision-making capabilities, aiding enterprises in achieving high-quality development during digital transformation.

Keywords: Intelligent Operation and Management System; Digital Transformation; Data Integration; Intelligent Application; Enterprise Efficiency.

1. Introduction

With the acceleration of global digital transformation, enterprise intelligent operation and management systems have become essential tools for improving management efficiency and optimizing resource allocation. In recent years, the rapid development of big data, cloud computing, and artificial intelligence has provided technological support for the intelligent upgrading of enterprise management systems. These systems integrate internal and external data, enabling automated business processes and scientific decision-making, helping enterprises address market competition and complex operational environments. Market research indicates that the global enterprise management information system software market is projected to exceed tens of billions of U.S. dollars by 2025, highlighting the industry's significant growth potential [1] [2].

In the digital economy era, enterprises face unprecedented opportunities and challenges. On one hand, emerging technologies offer more innovation and growth possibilities; on the other hand, intensified market competition and diversified customer demands impose higher requirements on operational efficiency and management capabilities. Traditional management models, often reliant on manual operations and fragmented systems, struggle to adapt to complex and dynamic business environments, leading to issues such as data silos, information delays, and inefficient decision-making. For example, many enterprises still depend on manual operations for supply chain management, customer relationship maintenance, and production planning, resulting in low efficiency and frequent errors [3].

The emergence of intelligent operation and management systems provides enterprises with a novel solution. By integrating internal and external data, these systems enable automated and intelligent business processes, allowing enterprises to monitor operational dynamics in real-time, optimize resource allocation, and enhance decision-making

efficiency. Additionally, these systems leverage data analysis and prediction to help enterprises proactively identify market trends and potential risks, enabling more scientific strategic planning.

2. Background and Current Status

2.1. Industry Background

The intelligent transformation of enterprise management systems is an inevitable trend in the digital economy era. As enterprises expand in scale and complexity, traditional management models can no longer meet the demands of efficient operations. The demand for information system construction is growing increasingly urgent.

Globally, digital transformation has become a core strategy for enterprises to enhance competitiveness. According to a report by International Data Corporation (IDC), global investments in digital transformation exceeded 2.3 trillion in 2023, with projection indicating the figure will surpass 3 trillion by 2025. This trend indicates that enterprises are accelerating their transition from traditional management models to intelligent, data-driven approaches. As a critical component of digital transformation, intelligent operation and management systems integrate big data, artificial intelligence, and Internet of Things (IoT) technologies to automate business processes, enable scientific decision-making, and optimize resource allocation.

For example, in the manufacturing industry, the advancement of Industry 4.0 has made smart manufacturing the mainstream direction. Intelligent operation and management systems achieve intelligent production planning, predictive equipment maintenance, and supply chain synergy through real-time data collection and analysis [4].

2.2. Enterprise Current Status

Currently, many enterprises still face challenges such as data silos, fragmented systems, and inefficient decision-

making in their operations. However, most enterprises remain in the early stages of digital transformation, lacking systematic data integration and intelligent applications. Manual operations in production management and quality control persist, leading to low efficiency and frequent errors that fail to meet market demands for high-quality products. While some enterprises have begun exploring digital transformation, most remain at the initial stage of intelligent operation and management system adoption, urgently requiring systematic data integration and intelligent applications to enhance operational efficiency and market competitiveness [5].

2.3. Necessity of Construction

Building intelligent operation and management systems is a key step for enterprises to achieve digital transformation. Through systematic data management and intelligent applications, enterprises can optimize resource allocation, improve operational efficiency, and strengthen market competitiveness. The construction of these systems is not only a necessary measure for enterprises to respond to market

competition but also a critical factor in achieving efficient operations and sustainable development. By integrating internal and external data, optimizing business processes, and enhancing decision-making efficiency, enterprises can gain a competitive edge in digital transformation and realize high-quality growth.

3. System Design

Following the flow of operational data, the system can be broadly divided into three stages (Figure 1). The first stage involves data generation, such as customer/supplier registration, bid registration, project registration, and contract registration. The second stage focuses on in-system data application, including internal operations, plan management (invoicing plans, payment plans, revenue plans), departmental dashboards, and executive dashboards. The third stage pertains to cross-system data application, such as integration with project management systems (ERP, PRP), design management systems (EPMS), science and technology management systems, and financial management systems.

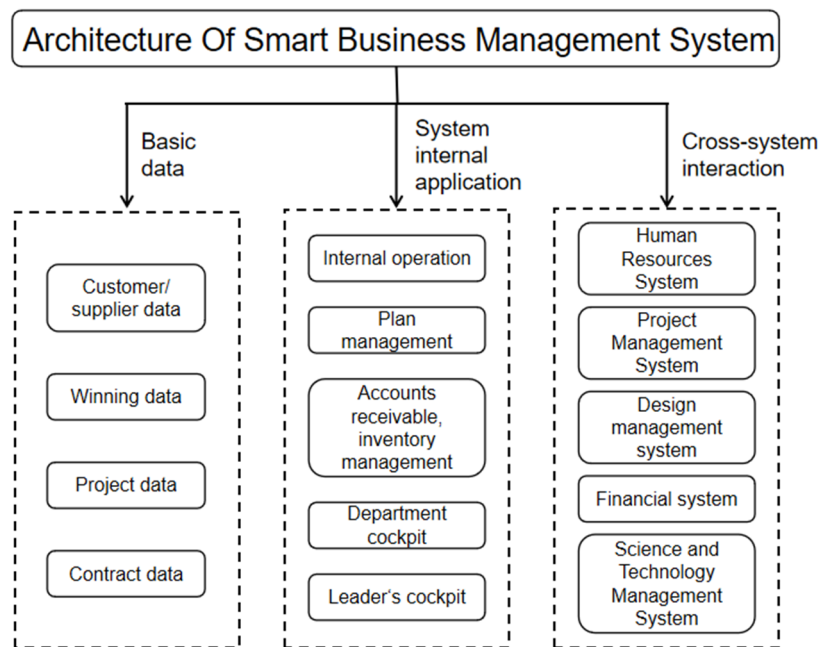


Figure 1. System Data Architecture Diagram

3.1. Basic Data Acquisition

3.1.1. Customer/Supplier Management

Customer/supplier management is a systematic process implemented by enterprises to enhance customer experience and optimize operational efficiency. As market competition intensifies, enterprises must leverage precise customer analysis and efficient service management to meet diverse needs and boost customer loyalty. Core requirements include customer information management, transaction record tracking, customer behavior analysis, personalized service recommendations, and feedback processing. These functionalities enable centralized customer information management, deep customer insight, and optimized sales/service processes, thereby improving operational efficiency and market competitiveness. Additionally, this system helps identify high-value customers, formulate targeted marketing strategies, and drive business growth.

3.1.2. Project Management

Project information registration is a systematic process for recording and managing project-related data, ensuring accuracy, completeness, and traceability. Its primary purpose is to provide information support for the project lifecycle, facilitating quick access and utilization. Functional aspects include information entry, classification, search, version control, and sharing, ensuring efficient team collaboration. Standardized processes reduce information gaps and errors, enhancing project execution efficiency. Furthermore, this system enables enterprises to track project progress, analyze key data, and support decision-making to achieve project objectives.

3.1.3. Contract Management

Contract information registration management involves systematic and standardized management of contract data in enterprise operations. The core requirement is ensuring accuracy, completeness, and traceability of contract information. As business complexity and contract volumes

increase, traditional manual recording methods fail to meet efficient management needs. Key functions include centralized contract storage, classification, rapid retrieval, and performance tracking. The goal is to enhance contract management efficiency and transparency through systematic approaches, providing reliable data support for decision-making while safeguarding enterprise rights and reducing operational risks.

3.2. In-System Data Application

3.2.1. Internal Operations

Internal operations involve revenue allocation among internal business units. For example, if Branch A secures a project requiring collaboration with Branches B and C, the internal operations module enables Branch A to allocate work and revenue to these branches. This module includes revenue allocation agreement reviews, virtual projects, virtual contracts, and revenue settlement functions.

3.2.2. Plan Management

Plan management involves monthly invoicing, payment, and revenue planning for signed projects by business units. Through standardized approval workflows, the company can analyze and statistically track monthly, quarterly, and annual completion rates, supporting executive decision-making.

3.2.3. Executive Dashboard

After filtering basic data, the system generates visualizations and reports through BI software to form the executive dashboard. This tool provides real-time monitoring and decision support for senior management. By leveraging data dashboards and intelligent analytics, managers can quickly grasp operational dynamics and make informed decisions.

3.3. Cross-System Data Interaction

3.3.1. Data Receiving

The system employs an open data integration architecture, fully supporting data connectivity and integration with multi-source, heterogeneous external systems. Through standardized APIs and WebService services, it seamlessly integrates personnel data from HR systems, compliance metrics from risk management systems, and operational logs from safety management systems. It also supports data access

from third-party platforms such as financial systems and ERP systems. The system includes an intelligent data routing module, capable of parsing and converting data formats like JSON, XML, and CSV, enabling unified management of structured and unstructured data.

3.3.2. Data Pushing

The system can push customer, supplier, project, incoming/outgoing contract data to other business systems, enabling cross-system collaboration and ensuring data consistency. For example, project data can be pushed to production planning and project management systems, while contract data can be sent to financial and procurement systems.

4. Data Visualization

The system constructs data visualization pages based on BI software, using API interfaces to connect in real-time with the business database, ERP, and CRM systems of the intelligent operation and management system, forming a complete data acquisition process. In the data processing layer, ETL tools clean and transform basic data, establishing a unified data warehouse. OLAP technology is applied to build data cubes covering six themes finance, operations, supply chain, etc. enabling analysis across dimensions such as region, time, customers, and business types.

The visualization layer employs dynamic dashboard technology, using tools like Power BI/Tableau to generate interactive executive dashboards. The main screen integrates KPI ring charts, heat maps, trend line graphs, and other visual components, with real-time updates of core metrics. A strategic dashboard module is specifically designed for executive decision-making, automatically generating operational health scores via AI algorithms and providing intelligent analysis reports, including capacity optimization recommendations and risk alerts, by combining historical data to simulate business trends.

By converting fragmented system data into visual decision dashboards, the system enhances meeting efficiency and response speed, truly achieving data-driven intelligent operations and management to support enterprise decision-making.

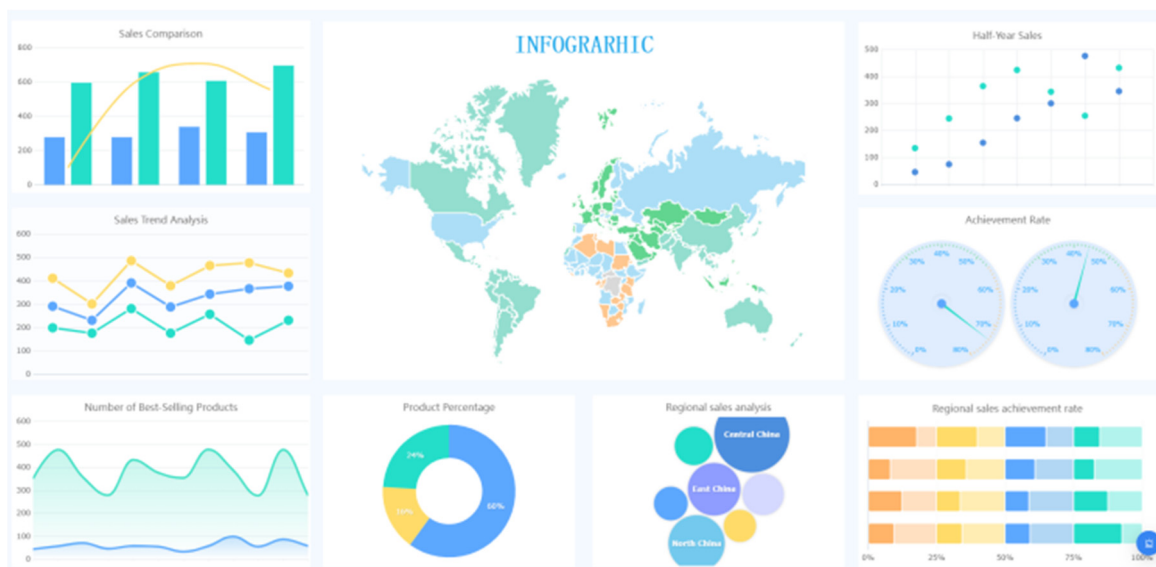


Figure 2. Data Visualization Diagram

5. Conclusion

As the core carrier of enterprise digital transformation, intelligent operation and management systems integrate cutting-edge technologies such as big data, cloud computing, and artificial intelligence to build an intelligent decision-making framework covering the entire business process. Currently, the system has overcome the limitations of data silos in traditional management models, enabling real-time sharing and deep analysis of multi-dimensional data in finance, production, and supply chain operations.

At the technical architecture level, the system demonstrates three transformative values: First, through BI analytics engines and dynamic data acquisition models, enterprises can precisely identify customer needs and profit hotspots, achieving optimal resource allocation. Second, embedded risk warning mechanisms combined with compliance audit functions effectively mitigate operational risks, such as ERP systems using cash flow forecasting and customer blacklists to reduce financial risks. Third, the application of mobile collaboration platforms and intelligent workflow engines breaks spatial and temporal constraints, improving approval efficiency.

It is foreseeable that intelligent operation and management systems will evolve from a tool-level to a strategic-level solution, becoming the core hub for enterprises to build intelligent ecosystems. Through continuous iteration of

algorithm models and cross-industry knowledge base accumulation, the system will drive full-value chain reconstruction in manufacturing, energy, and service sectors, ultimately achieving a spiral upgrade of "data assetization—decision intelligence—sustainable development."

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