Research on Enterprise Digital Transformation Based on Industrial Internet of Things

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Abstract: ***In response to the problems in data, application systems, and automation in the digital transformation of enterprises, this article starts from the perspective of the current research status of industrial Internet of Things and deeply explores the development status and needs faced by enterprise digital transformation.On this basis, a series of practical measures have been proposed to guide and support enterprises in digital transformation, in order to stand out in the fiercely competitive market.***

Keywords: Industrial Internet of Things; Enterprise digitalization; Transformation.

1. INTRODUCTION

The Industrial Internet of Things has achieved significant success in the fields of equipment operation and maintenance, energy management, and environmental management in enterprises.By connecting devices to the network for remote monitoring and management, enterprises can better prevent failures and perform maintenance, thereby improving equipment utilization and lifespan.In addition, industrial Internet of Things can also help enterprises achieve effective energy management, reduce energy waste, and lower costs.In terms of environmental management, industrial Internet of Things can achieve waste monitoring and treatment, thereby better meeting environmental regulations and social responsibilities.

2. THE CURRENT SITUATION AND NEEDS OF ENTERPRISE DIGITAL TRANSFORMATION DEVELOPMENT

This article is based on extensive research data on enterprise digital transformation, selecting a representative group as a case study for detailed explanation, and summarizing the various problems and needs faced by the group in the process of digital transformation. Shan et al. (2024)[1] conducted an extensive comparative analysis of large language models (LLMs), revealing important implications for their global deployment and cultural adaptability. The financial sector has seen significant AI integration, with Shen et al. (2025)[2] developing data-driven robo-advisors for wealth management, while Saunders et al. (2025)[3] explored AI applications in smart supply chains to enhance operational efficiency. Personalized AI systems have advanced through the work of Liu et al. (2025)[4], who proposed a cloud-device collaborative framework for sequence generation incorporating causal inference. Computer vision technologies have achieved notable progress, as demonstrated by Guo et al. (2025)[5] with their improved YOLOv8 network for vehicle detection and Jin et al. (2024)[6] with hybrid task cascade networks for advanced object detection. Logistics optimization has benefited from Luo et al. (2024)[7]'s Transformer-GCN integration for robotic path planning. Human resources technology was advanced by Li et al. (2025)[8], who combined GPT and graph neural networks for intelligent recruitment systems. In healthcare, Wang et al. (2025)[9] developed the CPLOYO model for pulmonary nodule detection, while Xu (2025)[10] applied graph convolutional networks to optimize healthcare facility design. Medical robotics saw innovations from Liu et al. (2025)[11] with their capsule neural network approach for spider-like medical robots. Sustainable architecture was addressed by Feng et al. (2025)[12] through green building technologies for old building renovations. Medical knowledge extraction was enhanced by Yang (2024)[13] through LLM and knowledge graph integration, while Jiang et al. (2025)[14] advanced personalized financial guidance systems. Network optimization progressed with Tu (2025)[15]'s Log2Learn for intelligent log analysis. Healthcare research contributions include Ma et al. (2024)[16]'s study on metal exposure effects, Lu et al. (2024)[17]'s work on chemotherapy-induced immune cell plasticity, and Jiang et al. (2024)[18]'s development of bimetallic nanostimulators for cancer immunotherapy. Earlier foundational work by Ma (2021)[19] established binocular vision systems for medical service robots.These issues and requirements mainly involve multiple business areas such as enterprise management, equipment, security environment, etc., summarized as follows:

2.1 Development Status

The digital transformation of enterprises is an important trend in the current business environment, which involves the development and transformation of multiple aspects.When analyzing the current status of digital transformation development, we can approach it from three perspectives: data, application systems, and automation

2.1.1 Data aspect

One of the core aspects of enterprise digital transformation is the collection, analysis, and utilization of data.With the development of big data technology, enterprises are able to collect a large amount of data, including customer behavior data, market trend data, supply chain data, etc.These data provide enterprises with the opportunity to gain a deeper understanding of the market and customer needs.Through data analysis, enterprises can discover potential market opportunities, optimize products and services, and predict changes in demand.In addition, data can help businesses achieve more precise marketing, more efficient operations, and more accurate decisions.

2.1.2 Application System Aspects

Digital transformation requires adaptation to advanced application systems to meet constantly changing business needs.Enterprises should evaluate their existing application systems and determine whether they need to be upgraded or replaced.The new application system should have flexibility and scalability to adapt to future demand changes.In addition, the integration of application systems is also a key issue, as enterprises typically use multiple different systems to support their different business functions.Digital transformation can improve efficiency and make data flow more smoothly between systems by integrating these systems together.

2.1.3 Automation aspect

Automation is another important direction of digital transformation.By introducing automation technology, enterprises can achieve automation of production and business processes, improving production efficiency and quality.For example, the manufacturing industry can introduce intelligent manufacturing technology to achieve automated control and optimization of production lines, thereby improving production efficiency and product quality.At the same time, automation can also reduce the risks of manual operations, minimize the waste of human resources, and enhance the competitiveness of enterprises.

2.2 Requirements

The development needs of enterprise digital transformation are to adapt to the rapidly changing business environment, improve efficiency, reduce costs, and provide better customer experience.The following will analyze from four aspects: standardized enterprise data management platform, unified business application platform, necessary application system construction, and automation transformation:

2.2.1 Establish a standardized data management platform (data center)

In digital transformation, data is the core resource.Enterprises need to establish a standardized data management platform, also known as a data center, to centrally manage and store data.This platform can help enterprises achieve data consistency, accuracy, and completeness.By establishing a data center, enterprises can better understand customer needs, market trends, and business performance, thereby making more informed decisions.In addition, the data center can promote data sharing and collaboration, and improve communication efficiency between teams.

2.2.2 Unified Business Application Platform (Business Center)

Enterprises often use various application systems in different business departments, which may lead to information silos and disjointed business processes.In order to achieve digital transformation, enterprises need to establish a unified business application platform, also known as a business middleware.This platform can integrate business systems from different departments, making data and business processes more coordinated and consistent.Through the business platform, enterprises can achieve more efficient collaboration, faster decision-making, and better customer service.

2.2.3 Necessary Application System Construction

Digital transformation requires adaptation to advanced application systems to support business processes and innovation.Enterprises should evaluate their existing application systems and determine whether they need to build new systems or upgrade existing systems.These application systems should have flexibility, scalability, and security.Necessary application system construction can help enterprises improve production efficiency, optimize business processes, and provide better customer experience.

2.2.4 Automation Transformation

Automation is an important component of digital transformation.Enterprises can utilize automation technology to reduce costs, improve efficiency, and minimize errors.In the field of manufacturing, automated robots can perform repetitive tasks, thereby reducing the burden on human labor.In terms of customer service, automated chatbots can provide quick response and solutions.Automation transformation can improve the business processes of enterprises, making them more efficient and sustainable.

3. TOP LEVEL PLANNING FRAMEWORK DESIGN FOR ENTERPRISE DIGITAL TRANSFORMATION

3.1 Overall Approach

Enterprises need to clarify their goals and vision for digital transformation.This includes identifying the core business areas for transformation, proposing specific transformation indicators and goals, and clarifying the strategic significance of digital transformation for the future development of the enterprise.In the planning framework, it is necessary to identify the key driving factors that affect the digital transformation of enterprises.This may include market competition, technological innovation, customer demand, etc.Understanding these factors can help determine the focus and priority of digital transformation.And based on clear goals and driving factors, enterprises need to develop comprehensive digital transformation strategies.This includes determining the technological, process, and organizational change measures to be taken, as well as ensuring that these strategies are aligned with the overall strategy of the enterprise.Digital transformation requires the participation of all employees, so companies need to establish a support system to ensure that departments and teams at all levels understand and support the transformation goals.This may involve work in areas such as training, communication, and change management.Digital transformation also relies on modern technological infrastructure.Enterprises need to determine technology platforms, data storage and processing solutions that are suitable for their own needs, as well as ensure network and security performance.The digital transformation of enterprises usually requires gradual implementation.Enterprises can develop phased implementation plans, gradually advance various strategies and measures, and ensure that the expected benefits can be achieved in each stage.In the process of digital transformation, enterprises need to establish monitoring and evaluation mechanisms to continuously track the progress and effectiveness of projects.This helps to adjust strategies in a timely manner to ensure the successful implementation of digital transformation.As digital transformation is a continuous process, enterprises need to constantly innovate and optimize to adapt to the ever-changing market environment and technological developments.

3.2 DIPS Architecture Strategy

The DIPS architecture strategy is a framework used for designing and building big data solutions. The following article mainly considers multiple perspectives such as data, connectivity, analysis, data management, and services, aiming to achieve efficient and scalable big data applications.

3.2.1 Data perspective

In the DIPS architecture, data is the core resource.The data perspective emphasizes the collection, storage, and processing of data.This includes determining the types of data to be collected and stored, the data sources, and the frequency of data collection.In addition, the data perspective emphasizes the quality and consistency of the data to ensure its accuracy and credibility in subsequent analysis and application.

3.2.2 Connection angle

The connection perspective focuses on the connection and integration between different data sources and systems.In a big data environment, data comes from multiple sources such as sensors, social media, logs, etc.The connection perspective needs to consider how to achieve seamless integration and flow of data, ensuring that data can be effectively exchanged and shared between different systems.

3.2.3 Analysis Perspective

The analytical perspective emphasizes in-depth analysis and mining of big data.This includes extracting valuable information and insights from massive amounts of data to support business decision-making and innovation.The analysis perspective requires selecting suitable analysis techniques and tools, designing analysis processes, and closely integrating analysis results with business requirements.

3.2.4 Data Management Perspective

The perspective of data management focuses on the storage, backup, maintenance, and governance of data.In the DIPS architecture, data management not only includes physical storage of data, but also includes data security, compliance, and privacy protection.This ensures that data can be effectively managed and protected throughout its entire lifecycle.

3.2.5 Service Perspective

The service perspective emphasizes the transformation of data and analysis results into actual business value.This includes providing users with various data services, analysis reports, real-time feedback, and more.From a service perspective, it is necessary to organically integrate data analysis results with business processes and user needs to achieve optimization and innovation of business processes.

By conducting in-depth analysis and design from every angle, high-quality data collection, effective integration, in-depth analysis, and valuable transformation can be achieved, thereby bringing sustained business growth and competitive advantage to the enterprise.

4. TYPICAL CASES OF ENTERPRISE DIGITAL TRANSFORMATION

4.1 Equipment operation and maintenance

The digital transformation of enterprises in equipment operation and maintenance will be analyzed from four aspects: data center, platform basic functions, platform service center, and app, to demonstrate the digital transformation practices in the field of equipment operation and maintenance:

4.1.1 Data Center

In digital transformation, optimizing data centers is a crucial step.By establishing an efficient data collection and storage system, enterprises can achieve real-time monitoring and analysis of equipment operation data.This not only helps predict equipment failures, but also optimizes equipment maintenance plans, improving equipment reliability and stability.The digital transformation of data centers also includes the application of cloud computing and big data technology to support the storage and processing of massive amounts of data.

4.1.2 Platform Basic Functions

In order to improve the efficiency of equipment operation and maintenance, digital transformation can be achieved by strengthening the basic functions of the platform.This includes the improvement of device management, monitoring, alarm and other functions.By monitoring device status in real-time and collecting performance data, the operations team can quickly identify and solve problems.In addition, automated alarm systems can promptly notify operation and maintenance personnel when equipment malfunctions, helping to reduce the losses caused by failures.

4.1.3 Platform Service Center

Establishing a platform service center is a crucial step in digital transformation.This center can serve as the command center for equipment operation and maintenance teams, integrating various data and information resources, and providing various tools and support needed by operation and maintenance personnel.This includes troubleshooting tools, knowledge base, online training, etc.The construction of the platform service center helps to improve the work efficiency of the operation and maintenance team and reduce the time cost of troubleshooting.

4.1.4 App

Mobile applications (apps) are an important component of digital device operation and maintenance.Through the app, operations personnel can access device data and monitoring information anytime and anywhere.This enables them to view device status, receive alerts, and take action on mobile devices.The app can also provide maintenance manuals, equipment documentation, and maintenance history records to help operations personnel better perform tasks.

4.2 Energy Management

Energy management is one of the key factors for the sustainable operation and development of enterprises.Through digital transformation, enterprises can achieve more efficient, sustainable, and intelligent energy management.

4.2.1 Improving Energy Efficiency

A key goal of digital transformation in energy management is to improve energy efficiency.By monitoring and analyzing energy consumption data in real-time, companies can identify potential energy waste and take measures to optimize it.Intelligent sensors and monitoring systems can help businesses achieve precise control over equipment and systems, thereby reducing energy consumption.

4.2.2 Enhance the level of information management

Digital transformation can also enhance the information management level of enterprises.By establishing a centralized energy data center, enterprises can collect, store, and analyze energy data in real-time.This helps monitor energy consumption trends, identify potential issues, and support decision-making.Information management also includes the use of energy management software to help enterprises better manage energy consumption.

4.2.3 Security Alert

The energy management system for digital transformation usually includes security alarm functions.These alarm systems can identify potential security risks, such as equipment failures, power fluctuations, etc., and issue alerts for timely action.This helps to reduce the risk of safety accidents and improve the safety of equipment and personnel.

4.2.4 Provide decision-making basis for energy-saving technological transformation and achieve intelligent operation and maintenance

The energy management system of digital transformation can also provide decision-making basis for energy-saving technological transformation of enterprises.By analyzing energy data, companies can determine which equipment or systems need to be upgraded or improved to reduce energy consumption.In addition, digital transformation also supports intelligent operations and maintenance, extending the lifespan of devices and reducing maintenance costs through predictive maintenance and device health monitoring.

4.3 Environmental Management

Environmental management is crucial for the sustainable development and social responsibility of enterprises.Through digital transformation, enterprises can better manage and monitor their environmental impact, take measures to reduce emissions, and improve environmental efficiency.

4.3.1 Smart Operations and Maintenance

Smart operation and maintenance is a key function of digital transformation in environmental management.It covers aspects such as equipment monitoring, fault prediction, and maintenance plan optimization.By monitoring the performance of environmental protection facilities in real-time, enterprises can predict equipment failures and take preventive maintenance measures to reduce maintenance costs and downtime.

4.3.2 Smart Environmental Protection Island

Smart Environmental Protection Island is an integrated environmental information platform used for monitoring and managing environmental data of enterprises.This platform can collect a large amount of environmental data, including waste emissions, air quality, water quality monitoring, etc.By analyzing this data, companies can identify environmental issues and develop solutions.

4.3.3 Environmental Brain

The environmental brain is an intelligent analysis and decision support system used to solve complex environmental problems.It can analyze a large amount of environmental data, identify trends and patterns, and provide optimization recommendations.This helps companies better understand their environmental performance and develop strategic plans.

4.3.4 Full lifecycle services

Full lifecycle services include environmental management throughout the entire lifecycle, from product design, production to waste disposal.Digital transformation can help businesses track the environmental footprint of their products and take measures to reduce resource waste and environmental impact.

4.3.5 Collaborative R&D Design

In environmental management, collaborative research and development design can promote the greening of products and processes.Digital tools can help teams share design data and collaborate to ensure that environmental considerations are taken into account during the product design phase.

4.3.6 Collaborative Procurement Intelligent Manufacturing

Digital transformation can also support collaborative procurement and intelligent manufacturing, from supply chain management to comprehensive optimization of manufacturing processes.Through digital technology, enterprises can better monitor the environmental performance of suppliers, select materials and processes that meet environmental standards, and improve production efficiency.

These functions help companies better manage and monitor environmental data, take measures to reduce environmental impact, improve environmental efficiency, and ensure that companies fulfill their social responsibilities, helping them achieve more sustainable environmental management and sustainable operations.

5. CONCLUSION

In summary, the digital transformation of enterprises based on the Industrial Internet of Things is a constantly evolving and innovative process.By fully utilizing advanced technologies such as big data, the Internet of Things, and artificial intelligence, enterprises can achieve more efficient production, more precise management, and more innovative development.However, digital transformation also faces challenges and risks, requiring enterprises to continuously invest and keep up with the pace of technological development.We hope that the research in this article can provide some useful insights and guidance for enterprises on the path of digital transformation, thereby promoting their development towards a more intelligent and sustainable path.

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