

An Analysis of the Impact of Supply Chain Digital Transformation on Enterprises

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Abstract: The innovation goals of enterprises are closely tied to their impact on the supply chain. As technology advances, businesses are increasingly prioritizing digital transformation as a key strategy. This paper aims to examine the impact of supply chain digital transformation on enterprises. The paper conducts case studies of three successful digital transformation instances in enterprises and assesses the impact of these transformations on the supply chain through qualitative analysis. Additionally, this paper summarizes the potential challenges of enterprise digital transformation through a literature review. The research indicates that digital transformation significantly enhances enterprise supply chains by enabling comprehensive monitoring and improving the speed and efficiency of responding to real-time market demand fluctuations. Furthermore, digital transformation fosters information sharing within the supply chain, reducing information asymmetry and providing a sound basis for decision-making within enterprises. Moreover, data-driven decisions optimize logistics efficiency. In conducting a literature review, this paper identifies two key reasons for the failure of enterprise digital transformation. The first factor is the lack of unified internal opinions and imperfect planning, while the second factor is the absence of essential personnel and equipment.

Keywords: Digital Transformation, Supply Chain, Enterprise Innovation, Impact Research.

1. Introduction

In today's fast-paced world of information technology, the significance of digital transformation for businesses has become increasingly evident. Previous research has generally used theoretical analysis concentrated on how digital transformation affects the supply chain of enterprises, such as research on its impact on industrial supply chains, the overall productivity of businesses, and other related factors by using model analysis [1]. Another study looked into how digital transformation affects employee well-being, offering management suggestions for companies via a questionnaire survey [2]. Another study used the literature review to show that the Internet economy can assist enterprises in creating a new supply chain supervision environment amidst the era of big data. Enterprises can achieve this by optimizing their spatial structure, which in turn enhances their overall innovation capability [3]. However, there is still a dearth of research on how a company's digital transformation specifically impacts its supply chain. It is crucial to bridge the gap between theory and real-world applications by delving into actual case studies to gain a better understanding of how digital transformation affects companies. This paper seeks to delve into the impact of digital transformation

on enterprise supply chains, with a focus on using case studies and qualitative analysis to conduct an in-depth examination of digital transformation case studies from Midea, Huawei, and Wahaha to assess previous digital transformation instances and their impact on supply chains.

2. Background

2.1. Introduction of Digital Transformation

"Digital transformation" entails an efficient enterprise operational model that integrates big data and artificial intelligence technologies, applying them to enterprise business and management. Digitalization comprises the comprehensive digitization of business, management, and operations. In today's business landscape, digital transformation has emerged as a key strategy for organizations to integrate digital technology across all aspects of their operations. Notable instances of digital transformation can be seen in companies such as Uber, Airbnb, and Netflix, which have effectively utilized mobile and cloud computing technologies to bring about revolutionary changes within their respective industries. According to McKinsey, the ultimate aim of digital transformation is to gain a competitive edge by consistently implementing technology at scale to improve customer satisfaction and cut costs [4].

2.2. Introduction of Supply Chain

The concept of supply chain was first introduced by Reiter in 1996, defining it as a network of entities through which products and services are delivered to specific customer markets [5]. The main goal of the supply chain is to satisfy customer needs while generating profits. It encompasses all the links related to meeting customer needs, including producers, suppliers, transportation, warehousing, retail, and customers themselves. The supply chain encompasses the primary enterprise and its expansion both upstream and downstream, forming a comprehensive network structure. It involves the journey from raw materials to intermediate products, final products, and ultimately reaching consumers through the sales network. Customer demand serves as the driving force within the supply chain, and this influence extends upward starting from the initial customer demand. Supply chain activities can be categorized into three main areas: goods development and manufacturing, goods distribution, and goods sales and after-sales service. These activities form an integrated supply chain. Figure 1 shows the basic model of a supply chain.

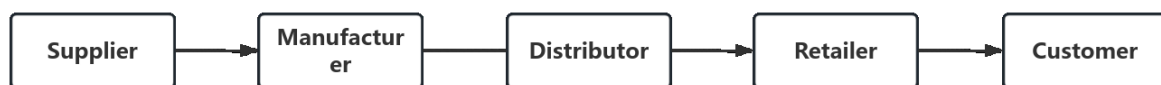


Figure 1: Basic supply chain model

Based on this information, this paper can analyze the impact of digital transformation on each position in the supply chain with a more clear framework, including production, supply, transportation, storage, and retail.

3. Case Study

This article will analyze Midea, Huawei, and Wahaha as cases of digital transformation. The examples were chosen because they all hold a leading position in their respective industries and serve as exemplary models. This is in line with the requirements of academic writing. Midea Group, a global technology group, operates in home furnishings, robotics, industrial internet, and other sectors. After a successful digital transformation, the company now possesses the entire value chain and

intelligent manufacturing capabilities. Huawei, as the world's leading ICT infrastructure and intelligent terminal provider, has initiated digital transformation and supply chain reform to address challenges and promote sustainable supply chain ecology. Wahaha, a prominent company in the Chinese food and beverage industry, has faced threats from e-commerce and responded by integrating all wholesalers, distributors, and terminal stores into a digital supply chain system network.

3.1. Midea

Midea Group is a global technology company that has invested nearly 50 billion yuan in research and development over the past five years, with over 17 billion yuan dedicated to digital transformation. Midea currently operates about 200 subsidiaries, more than 30 R&D centers, and production bases worldwide, serving customers in over 200 countries and regions. Since 2012, the company has actively pursued its digital transformation strategy, resulting in a new digital operation model focused on customer demand, leading to improved efficiency and net profit growth. In the first half of 2023, Midea reported a net profit of 18.232 billion yuan, a 39.22% increase year on year, with a net operating cash flow exceeding 29.8 billion yuan [6]. Midea's digital transformation comprises four key processes: the "632" project, T+3 mode, industrial Internet, and 5G factory.

(1) "632" project

The "632 Project" was proposed by its chairman, Fang Hongbo, and can be summarized as six operational systems, three management platforms, and two technology platforms. This means that all business units need to adopt the same operating system, management platform, and technology platform to ensure consistency. The six operational systems are: 1. Product Life Cycle Management (PLM); 2. Supplier Relationship Management (SRM); 3. Advanced Planning and Scheduling (APS); 4. Enterprise Resource Planning (ERP); 5. Manufacturing Execution System (MES); 6. Customer Relationship Management (CRM). The three management platforms are: 1. Business Intelligence (BI); 2. Finance Management System (FMS); 3. Human Resource Management System (HRMS). The two technology platforms are the Midea Information Portal (MIP) and the Midea Development Platform (MDP). The "632 Project" is not limited to internal replacement of IT systems but represents an enterprise transformation. Midea aims to achieve process consistency, data consistency, and system consistency. A set of processes should be adopted among business divisions of the group, and all data such as customers, suppliers, and materials should be consistent at the group level. After the change, all systems belong to the group, which has helped Midea operate efficiently throughout the supply chain and improved the group's management and control capabilities.

(2) T+3 mode

The T+3 model was introduced by Yin Bitong, the director and vice president of Midea. This model uses "Internet +" intelligence to transform the group into a "production based on sales" approach, which leverages consumer data to drive enterprise development and achieve efficient management. In simple terms, it means producing goods based on customer demand and quickly fulfilling orders. Upon receiving an order, the factory promptly prepares materials, manufactures the product, and delivers it, all within a span of three days. This approach has helped Midea significantly reduce inventory backlogs and complete the logistics process faster. The core idea is to streamline every aspect of the supply chain to improve turnover, reduce costs, increase sales profit margins, and ultimately enhance ROE (Return on equity = profit margin on sales \times asset turnover \times equity multiplier (financial leverage)). Figure 2 illustrates the schematic diagram of Midea Group's "T+3" model.

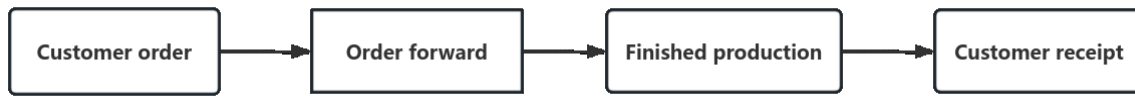


Figure 2: Midea Group "T+3" model schematic diagram

(3) Industrial Internet

In 2018, Midea connected 189 devices in 41 categories at the Guangzhou Nansha Smart Factory using intelligent gateway technology with the hardware capability of industrial Internet. This resulted in a 28% increase in labor efficiency, a 14% reduction in unit cost, a 56% shorter order delivery cycle, an 80% reduction in the inventory of raw materials and semi-finished products, and a two-to-four-times increase in logistics turnover with the self-developed automatic distribution system of the injection molding warehouse. This increased the monthly production capacity from 300,000 sets to 900,000 sets [7]. In October 2018, Midea released M.IoT Midea Industrial Internet 1.0 through its subsidiary, the Midea-Cloud Company, providing "manufacturing knowledge, software, and hardware" trinity manufacturing digital transformation solutions. In November 2020, Midea released the United States Industrial Internet 2.0, which launched the "four horizontal and eight vertical" development system. "Four horizontal" refers to the four layers of capabilities of Midea: capability layer, application layer, business layer, and industry layer. Among them, the capability layer is open to partners through the cloud infrastructure provided by KUKA Robot and Midea Cloud. The application layer includes marketing, research and development, intelligent manufacturing, and management fields. The commercial layer uses "eight vertical," which refers to the eight sub-plates of the commercial layer.

(4) 5G factory

In 2019, Midea partnered with Huawei and China Telecom to build the country's first 5G factories. In these factories, Huawei provides 5G equipment, China Telecom serves as the 5G operator, and Midea is responsible for implementing applications, replacing wired networks through high-speed wireless transmission. After the cooperation, all PLC controllers were moved to the computer room to facilitate on-site maintenance. Security is also an application scenario of 5G. Midea requires 5G technology and facial recognition systems to be used in the factory, and workers to wear hard hats. The Midea factory utilizes automation to replace personnel, resulting in lower input costs and faster outcomes, thereby enabling enterprises to reduce costs and increase efficiency.

In short, Midea's "632" project allows for comprehensive supply chain monitoring, reducing potential risks. The T+3 mode enhances Midea's supply chain flexibility. Through the use of intelligent algorithms and data analysis, this mode enables Midea to predict real-time market demand and adjust strategies accordingly, thus avoiding issues related to inadequate stock preparation. Furthermore, Midea leverages the Industrial Internet of Things and 5G factories to enhance production efficiency and risk management, while the automated distribution system boosts logistics turnover.

3.2. Huawei

As a pioneer in scientific and technological innovation, Huawei has revolutionized the traditional ERP enterprise resource management system during the digital transformation of the supply chain through its ISC+ Vision (ISC: integrated supply chain) transformation of the entire supply chain. This transformation is divided into three key parts: data commercialization, service reconstruction, and governance systematization.

(1) Data Commercialization

Huawei utilizes various technologies such as combination optimization, statistical prediction, and simulation to build the core algorithm model of the database. This model is then applied to four core scenarios: resource preparation, supply fulfillment, supply network, and intelligent operation, allowing for digital management of the entire process from product design to manufacturing. Moreover, various working platforms are used to collect and organize all types of information, leading to the creation of an enterprise-level data lake exclusive to Huawei. These algorithmic models help Huawei to introduce innovative products more swiftly to meet the changing needs of its customers. Additionally, by incorporating technologies like the Internet of Things and big data analysis, Huawei can monitor production processes in real time, optimize production plans, and enhance production efficiency and quality.

(2) Service-oriented reconstruction

Huawei is in the process of implementing a service-oriented reconstruction of its IT system for the service chain. This involves breaking down the traditional single large system into service-oriented subsystems, and addressing refinement and efficiency issues through the Integrated Service Delivery Platform (ISDP). The ISDP's Standard API technology connects third-party project stakeholders, Huawei, and partners to establish a "standardization + customization" service channel. The ISDP's Portal page allows customers to quickly develop applications and independently tailor solutions to create more business value. The implementation of service-oriented subsystems enhances the flexibility and efficiency of Huawei's supply chain system, enabling rapid customization to meet various business requirements.

(3) Governance systematic

Huawei's approach to building a collaborative supply chain involves leveraging Ecosystem Resource Planning (EPR+) as its core concept. The company has established a centralized operation center and implemented a two-way data transmission mechanism between the data layer and the operation layer. This allows for centralized deployment through function prediction and process supervision, transforming the work of independent departments into centralized processing. By using standardized tools and models, Huawei efficiently completes cross-department projects and processes. Through sharing data with its supply partners, Huawei narrows the information gap between itself and the external environment, identifies key supply points, conducts advance capacity planning, and designs optimal supply schemes. Collaboration with the supply and demand sides helps to improve demand management, supply capacity, performance mode, and risk management.

In general, Huawei's digital transformation involves managing the entire supply chain process digitally using algorithm models. This allows for comprehensive monitoring of the supply chain, improving production efficiency and quality, and accelerating the introduction of innovative products to meet market demands and enhance customer satisfaction. Huawei has restructured its IT system to be service-oriented and used ISDP to make the supply chain system's operation process more flexible, efficient, and intelligent. Furthermore, Huawei has implemented data sharing through EPR+ to share supply chain information.

3.3. Wahaha

Wahaha, founded in 1987, has become a leading company in China's food and beverage sector. However, it faced challenges from e-commerce in 1999 and the epidemic in 2020. As a result, Wahaha's offline store sales declined sharply, and the epidemic caused a loss of 100 million yuan. In response, the company underwent digital transformation with a focus on data-driven optimization and innovation in its production line, management center, sales system, and marketing platform.

(1) Production Line

In 2015, Wahaha partnered with Siemens to implement China's first digitally intelligent beverage production line in Xiasha, Hangzhou. Using Siemens Profinet industrial network in conjunction with

Siemens Simatic technology, the production line achieves equipment interconnection and central monitoring. This setup facilitates "flexible" production, which enhances manufacturing flexibility and capacity, shortens product production cycles, and improves equipment utilization, labor productivity, and product quality. Wahaha's automated production line for purified water produced over 50 million boxes per month in 2022 [8]. Additionally, it enables product traceability, ensuring quality and food safety, and offers precise control over the production process.

(2) Management Center Platform

Wahaha established a "private cloud" in 2019 as its own data center, aiming to streamline the organizational hierarchy and enhance the group's decision-making efficiency. With over 80 production bases and hundreds of branches nationwide, the digital center overcomes communication barriers between departments, thereby improving the group's decision-making and operational efficiency. Real-time sales data from all branches and dealers can be promptly fed back, and relevant reports can be automatically generated through the data center on the same day.

(3) Sales System:

Wahaha has implemented a data-driven sales management system using digital technology to oversee sales personnel and products. This system enables Wahaha to effectively monitor price fluctuations in the supply chain and streamline various operational processes. Furthermore, by analyzing customer data, Wahaha can create precise customer profiles for terminal stores, providing strategic support for new product development, maintenance, and distribution.

(4) Marketing Platforms:

Since 2018, Wahaha has developed various digital marketing platforms, including Kangyouli, Fuhuibao, a cross-border e-commerce platform, and Habao Amusement Park. These platforms serve different functions and target specific demographics. For example, in 2021, Wahaha launched the physical e-commerce platform Fuhuibao, where manufacturers or brands can join without any fees and can utilize Wahaha's channel resources. This initiative has opened up the supply chain distribution system and established a big data network. When a consumer places an order on this platform, the system can swiftly match the order to the nearest terminal store and deliver the goods promptly. This process enables dealers to improve their supply chain management efficiency and implement precise digital marketing management. Terminals can select products with high turnover and profitability through strict selection. For consumers, products that are sourced directly from manufacturers and undergo rigorous quality inspections often indicate good quality and affordable prices.

In general, Wahaha has achieved comprehensive supply chain monitoring through digital construction, bolstered by the establishment of a "private cloud" to enhance data analysis and streamline operations. Wahaha's data-driven sales management system allows rapid adaptation to market changes, supported by various marketing platforms that facilitate information sharing and supply chain visualization.

4. Challenges Analysis

In a 2018 report by McKinsey, it was highlighted that enterprises face significant challenges in achieving success with digital transformation. The success rate for digital transformation in industries with an existing digital foundation is as low as 26%, while traditional industries struggle even more, with success rates ranging from 4% to 11% [9]. In a 2022 analysis of digital transformation in Chinese retail enterprises, McKinsey identified five main difficulties and challenges faced by these companies:

- Lack of clear transformation strategies, goals, and plans, leading to unclear digitalization focus.
- Shortage of digital talent and insufficient capability for talent development and training.
- High uncertainty in the return on investment for digital transformation, especially in predicting profitability through online channels.

- Inflexible and slow existing organizational structures and production processes, making it challenging to adapt to rapid digital transformation.
- Inadequate awareness and enthusiasm for enterprise digital transformation among frontline employees and leadership [10].

5. Conclusion

In the analysis of three cases of enterprise digital transformation, a prevalent objective emerged: to achieve comprehensive supply chain monitoring capability and enhance agility in responding to real-time market demand fluctuations with increased efficiency. Furthermore, digital transformation facilitates seamless information sharing within the enterprise supply chain, mitigating potential information asymmetry and providing a precise, scientific basis for decision-making. Additionally, leveraging data-driven decisions, digital transformation optimizes logistics efficiency. It is evident that these goals represent the primary impacts of digital transformation on enterprise supply chains. However, there are several challenges that must be addressed and overcome in order to successfully achieve digital transformation. The paper primarily examines the influence of digital transformation on enterprise supply chains through case analysis. However, real-life cases are often influenced by multiple factors, indicating that a detailed analysis of only three cases is inadequate for a comprehensive understanding. Therefore, a more comprehensive understanding of the impact of digital transformation on supply chains requires the inclusion of additional case studies to gather more comprehensive information.

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