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Research on the Path to Achieving Dynamic Capabilities in Lighthouse Factories to Enhance Corporate Performance

Keyao Zhu[1,a,#], Siyan Du[1,b,#], Xinyou Yu[1,c,#], Ying Lv[1,d,#], Yuhan Si[1,e,#], Yuyao Qin[1,f,#]

[1]*Beijing 21st Century School, Beijing, 100080, China*
[a]*18384236956@163.com,* [b] *Celia0419@163.com,* [c] *2720182778@qq.com,* [d] *lvying090209@163.com,* [e]*siyh922@163.com,* [f] *17800480807@163.com*

Abstract: *This paper is based on the Dynamic Capabilities Theory (DCT) and explores in depth how lighthouse factories enhance corporate performance through the dynamic capabilities of utilizing technology and data resources. The study focuses on how lighthouse factories, during their digital transformation, perceive market changes, seize technological opportunities, and restructure resources to maintain competitive advantages. By employing grounded theory methods to conduct a qualitative analysis of the annual reports of 79 lighthouse factories, this paper reveals their dynamic capabilities in the identification and perception, integration and organization, and innovation and reconfiguration of resource elements, and investigates the impact of these capabilities on corporate financial performance, innovation performance, and sustainable competitive advantage. The findings show that lighthouse factories effectively promote corporate digital transformation and enhance sustainable competitive advantages by fully utilizing technology and data resources and emphasizing the identification and perception, as well as the integration and organization of resources. Future efforts should focus on the potential value of resource elements and continuously deepen innovation and reconfiguration to improve the efficiency of resource utilization.*

Keywords: *Lighthouse Factories, Dynamic Capabilities, Corporate Performance, Innovation, Sustainable Development*

1. Introduction

With the global manufacturing industry entering the era of Industry 4.0, digital transformation has become a key pathway for enterprises to enhance their competitiveness. Smart manufacturing technologies such as artificial intelligence (AI), the Internet of Things (IOT), cloud computing, and big data analytics are reshaping production methods, improving production efficiency, and optimizing resource allocation. Against this backdrop, the World Economic Forum (WEF) and McKinsey & Company jointly launched the "Lighthouse Factories" initiative, which aims to select the most digitally transformative factories globally and use them as industry role models to drive the digital transformation of manufacturing.

Lighthouse factories not only represent the application of advanced manufacturing technologies but also emphasize the strategic adjustments and organizational changes that enterprises need to make in the face of the digital wave. Unlike traditional manufacturing enterprises, lighthouse factories can effectively integrate cutting-edge technologies to build flexible, efficient, and sustainable production systems. However, despite the successful cases of lighthouse factories providing references for manufacturing enterprises, many companies still face challenges in the digital transformation process, such as difficulties in technology integration, resistance to organizational change, talent shortages, and uncertainties in return on investment. Therefore, how to systematically understand the digital transformation path of lighthouse factories and provide replicable experiences for other enterprises has become a question for research.

Current research on the digital transformation of lighthouse factories mainly focuses on the application of technologies, such as the specific application scenarios of Industrial Internet of Things (IIoT), intelligent robots, and 5G communication. However, digital transformation is not just a process of technological upgrading but also involves how enterprises perceive market changes, capture

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technological opportunities, and reconfigure resources to maintain competitive advantages. These capabilities are particularly important in a dynamic competitive environment. Therefore, it is necessary to analyze the transformation path of lighthouse factories from the perspective of corporate strategy and organizational capabilities.

This paper will focus on analyzing the process by which lighthouse factories enhance corporate performance through dynamic capabilities, from the perspective of technology and data resource utilization, based on the Dynamic Capabilities Theory (DCT). Dynamic capabilities theory, proposed by Teece et al[1]., emphasizes that enterprises must possess three core capabilities-sensing, seizing, and transforming-in a rapidly changing environment to adapt to market changes and maintain competitive advantages. This theory is highly consistent with the core logic of digital transformation. During digital transformation, enterprises need to closely monitor technological change trends, analyze market demands, and actively explore the potential impacts of emerging technologies such as 5G, AI, and digital twins on manufacturing, that is, to have sensing capabilities. After sensing market opportunities, enterprises need to quickly adjust their strategies, invest in key technologies, optimize business processes, and build new business models, that is, to have seizing capabilities. Enterprises must make in-depth adjustments in organizational structure, talent cultivation, process management, and other aspects to ensure the successful implementation of digital technologies and form sustainable competitive advantages, that is, to have transforming capabilities.

Applying dynamic capabilities theory to the study of lighthouse factories helps to systematically analyze the path of digital transformation to enhance corporate performance and reveal how successful enterprises use the three capabilities in dynamic capabilities theory to drive digital transformation. This paper will use the case study method and select several representative lighthouse factories as research objects, such as Lenovo, Haier, and Midea. These enterprises have shown different strategic paths and technological application methods in the process of digital transformation and have strong representativeness.

The research in this paper summarizes the successful experience of lighthouse factories and refines replicable digital transformation paths to provide strategic guidance for other manufacturing enterprises. In particular, the conclusions of this study can provide valuable references for the digital transformation of small and medium-sized enterprises.

2. Literature Review and Theoretical Framework

Dynamic capabilities theory has become one of the most active research topics in the strategic management literature, explaining how enterprises can improve their match with the dynamic environment and quickly respond to changes in external technology and markets (Helfat et al., 2007)[2]. Teece (2007)[3] defined dynamic capabilities as the organizational capabilities that allow companies to establish and renew resources and assets, and enterprises reconfigure and update existing resources as needed to quickly respond to changes in the market and business environment and technological opportunities. This definition laid the foundation for subsequent research and focused scholars on how enterprises use dynamic capabilities to achieve their own development and transformation.

Reviewing the development of strategic management theory, in the 1960s and 1970s, classical strategic management theory emphasized that the purpose of enterprises implementing strategic behavior was to adapt to the environment (Ansoff and Stewart, 1967)[4].

In the 1980s, scholars systematically analyzed the impact of the five competitive forces in the industry on corporate profitability and constructed their competitive advantages based on the value chain analysis model (Porter, 1979)[5]. Subsequently, the resource-based view emerged, which is based on the two assumptions of the heterogeneity and immobility of corporate resources. Therefore, the resource-based view is a static research perspective on the sources of corporate competitive advantages and has a strong static analysis tendency.

Until the late 1990s, dynamic capabilities theory broke through the static perspective of corporate strategic analysis, laying the foundation for the dynamic matching of the resources, capabilities, and environment that companies possess, and further expanding the static research perspective of the resource-based school (Teece et al., 1997)[6].

However, with the acceleration of market environmental changes, enterprises face new challenges in development. Although it considers the long-term growth and sustainability of competitive advantages of enterprises, in the face of rapid environmental changes, when organizations need to develop new

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capabilities, the "inertia trap" problem caused by past path dependence and the "rigidity" problem of core capabilities based on past experience and mental models gradually emerge (Leonard-Barton, 1992)[7].

The specific manifestations of dynamic capabilities have always been a research hotspot, focusing on "innovation capabilities," "absorptive capabilities," "adaptive capabilities," and "dynamic management capabilities." In addition, the influencing factors and mechanisms of dynamic capabilities are also the focus of scholars' research (Schilke et al., 2018)[8].

In the context of digital transformation, the importance of dynamic capabilities for corporate digital transformation has become increasingly prominent. Scholars have pointed out that the dynamic capabilities constructed by enterprises to change, expand, or adjust existing company resources, processes, and values help enterprises carry out digital transformation (Warner and Wager, 2019)[9]. Similarly, in the face of a large amount of information that enterprises need to deal with in the digital environment, dynamic capabilities have become the most important tool to help enterprises manage, process, and organize information within a limited time to assist business decision-making. In the digital economy era, dynamic capabilities can create business value for organizations through big data management (Rialti et al., 2019)[10].

Eisenhardt and Martin (2000)[11] proposed that dynamic capabilities consist of specific strategic processes such as product development processes, strategic decision-making processes, and alliances, enriching the connotation of dynamic capabilities theory. Numerous studies have shown that dynamic capabilities have a positive impact on improving corporate financial performance (Zott, 2003)[12], innovation performance (Helfat, 1997)[13], and obtaining long-term competitive advantages (Teece et al., 1997).

Based on dynamic capabilities theory, this study analyzes the process of dynamic capabilities realization of lighthouse factories from the perspective of resource utilization. Referring to the research of previous scholars, this paper will identify the resource elements of enterprises and explore the three aspects of dynamic capabilities: identification and perception, integration and organization, and innovation and transformation of resource elements. The study explores the impact of dynamic capabilities on corporate performance (sustainable competitive advantages, financial performance, and innovation performance). As shown in Figure 1, the theoretical analysis framework of this paper is presented below (Figure 1).

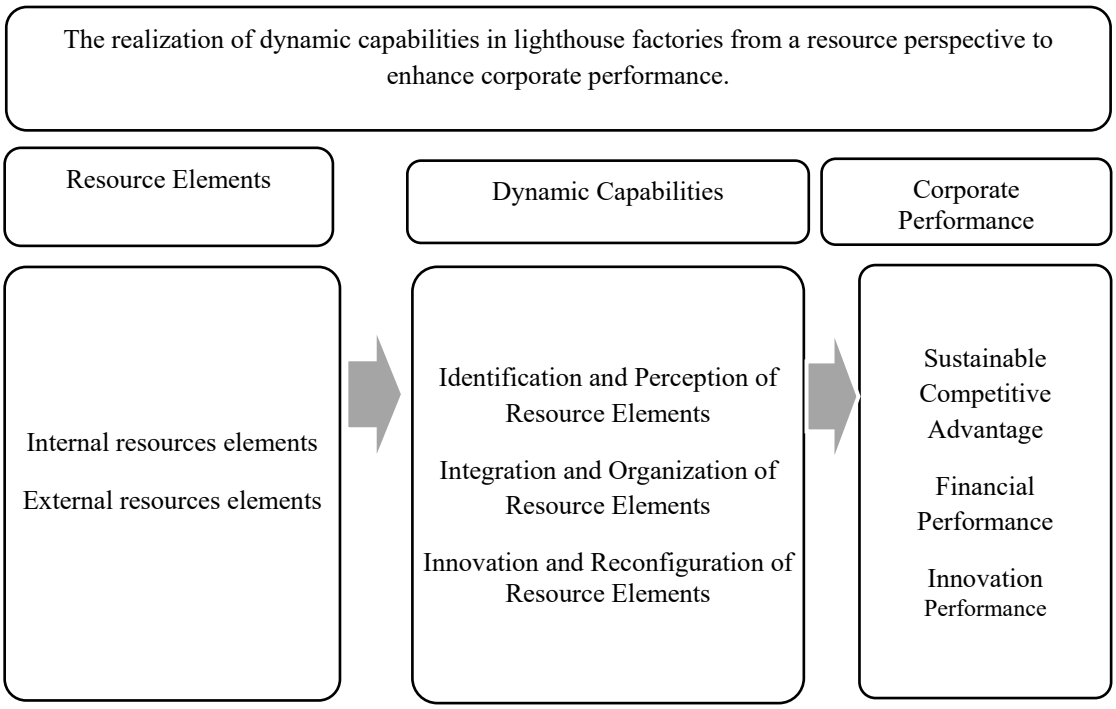

Figure 1: Analysis Framework of Dynamic Capabilities Realization to Enhance Corporate Performance in Lighthouse Factories from a Resource Perspective

Based on the analysis framework, this paper analyzes how enterprises value internal and external

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resource elements, carry out the identification and perception, integration and organization, and innovation and transformation of resource elements from a resource perspective. This process forms the dynamic capabilities of enterprises to adapt to the digital economy environment, thereby enhancing the sustainable competitive advantages, financial performance, and innovation performance of enterprises.

3. Research Questions and Data Collection

3.1. Overview of Chinese lighthouse factories and data collection

This study focuses on the unique group of lighthouse factories, with 79 factories listed by the World Economic Forum (WEF) as representatives of the cutting-edge integration of intelligence, digitalization, and green technologies in the Industry 4.0 era. The data are derived from the annual reports of these companies, primarily from their 2022, 2023, and 2024 annual reports, as well as the 2024 half-year reports. A total of 79 companies were identified, and 33 were selected for this study, with a total of 87 annual reports analyzed. From these 87 reports, 309 data points were extracted to form the core dataset for the research. These 33 companies are the most representative among the 79, including well-known enterprises such as Midea, Danfoss, and Siemens.

The basic information of these companies is shown in the figure below:

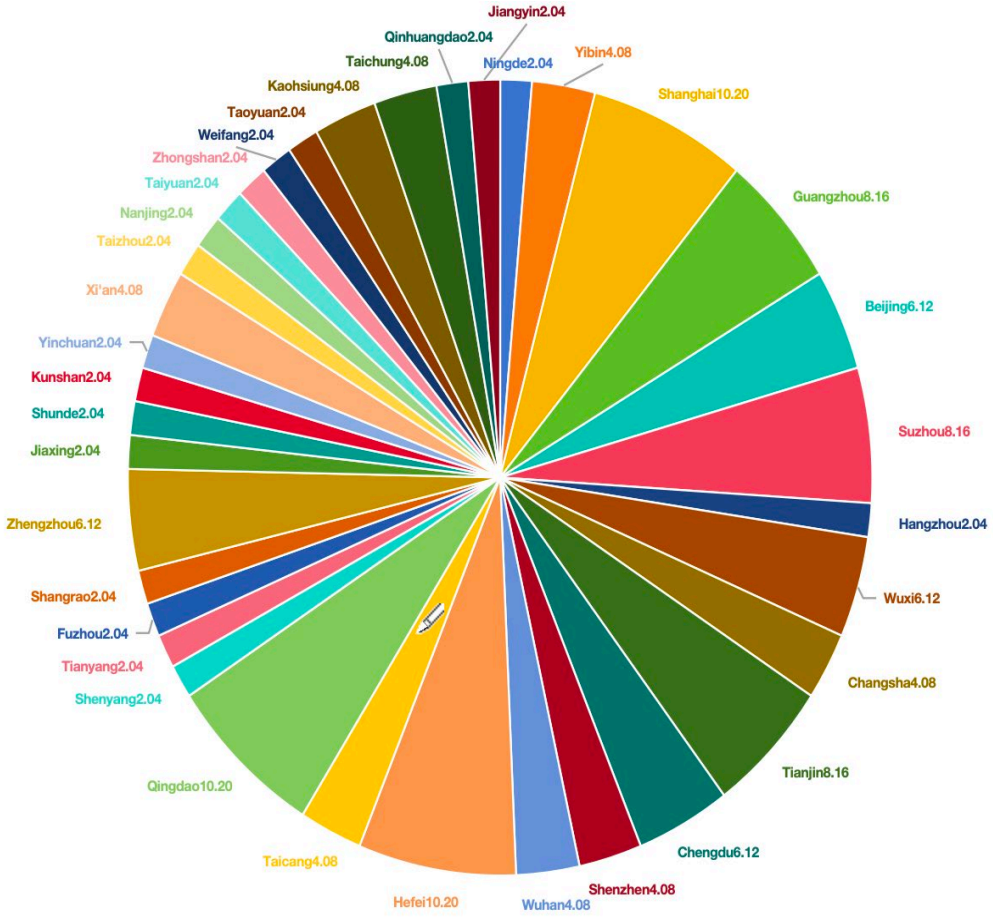

Figure 2. Urban proportion

From the above chart, it can be seen that the proportion of lighthouse factories in Shanghai, Qingdao, and Hefei accounts for 10.20%. The proportion of lighthouse factories in Suzhou, Tianjin, and Guangzhou is 8.16% (Figure 2).

From Figure 3, household application is accounts for 17.72%, electronic application is proportion of 16.46%, Industrial equipment & CARS is 11.39% .

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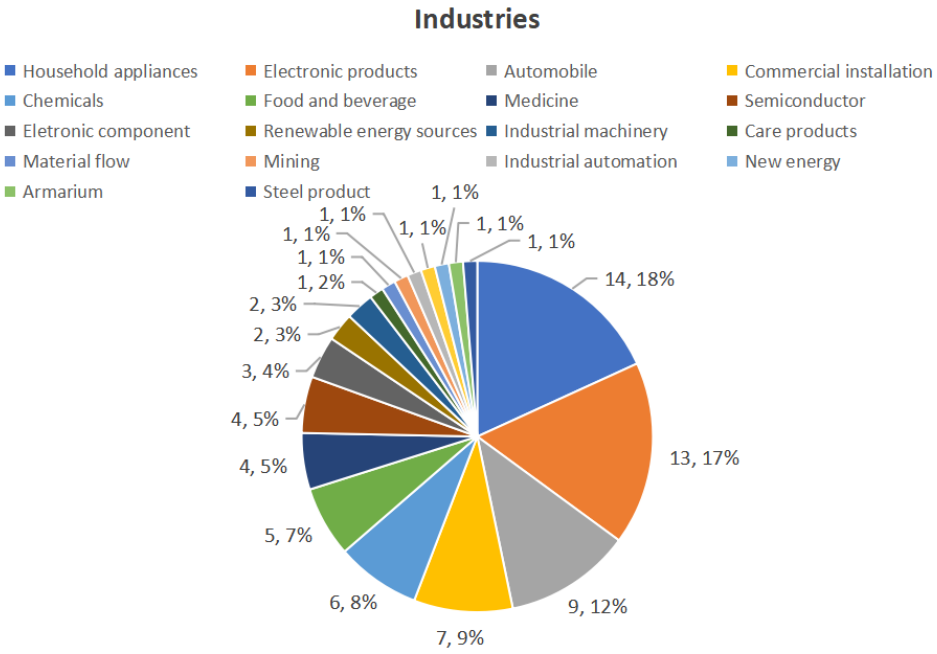

Figure 3. Distributions of different industries

As shown in Figure 4, domestic enterprise is accounts for 70.17%, foreign-owned enterprise is proportion of 29.83%, which means most lighthouse factories are owned by domestic enterprises.

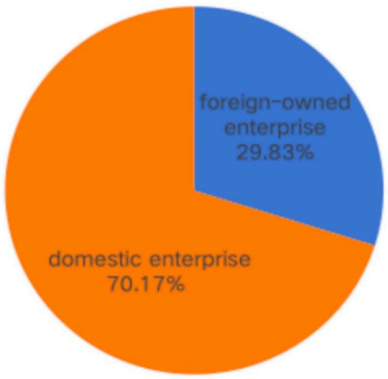

Figure 4 Proportion of domestic and foreign-funded enterprises

3.2. Research questions and methods

This paper employs Grounded Theory (GT) as the core qualitative research method, aiming to inductively develop a theoretical framework regarding the dynamic capabilities of lighthouse factories through an in-depth analysis of empirical data. This framework will further explore how the realization of dynamic capabilities can enhance corporate performance. Grounded Theory is an exploratory research approach that emphasizes generating theory from data rather than verifying existing theoretical frameworks. Unlike traditional theory-driven research, GT is highly flexible and adaptable, allowing researchers to capture the complexity and dynamism of the subject under study.

In the application of Grounded Theory, researchers engage in a process of constant comparison, abstraction, and generalization to distill key concepts from empirical data and gradually construct a theoretical framework. Data collection and analysis are conducted concurrently, with researchers refining their research on an ongoing basis through reflective practice. This ensures that the final theoretical framework closely aligns with reality. The core advantage of this method is its ability to produce theories with high practical value, making it particularly suitable for exploring complex and under-researched areas.

Lighthouse factories, as global benchmarks in manufacturing, provide a rich context for this study. The World Economic Forum releases an annual list of lighthouse factories, which exhibit varying

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dynamic capabilities in their application of digital transformation. This phenomenon offers profound theoretical exploration space for this research.

To better understand the differences and commonalities in the realization of dynamic capabilities among lighthouse factories, this paper consolidates lighthouse factories within the same group. This approach allows for an analysis of how enterprises form and coordinate dynamic capabilities at the group level, thereby driving overall group performance. Through consolidation, researchers can more effectively identify the distinct strategies, resource allocation, and technological application paths adopted by different groups during digital transformation, providing broader and deeper empirical evidence for the theoretical construction of dynamic capabilities.

This paper collected a large amount of quantitative and qualitative data from 87 annual reports of 33 groups from 2022 to 2024. These reports provide rich information, including but not limited to financial performance, technological investment, production efficiency, market expansion, and internal management indicators. Through in-depth analysis of these data, this paper identifies how lighthouse factories at different developmental stages reconfigure resources, innovate technologically, and adapt to market changes through dynamic capabilities to enhance overall corporate performance.

In the analysis process, researchers first conduct preliminary classification of various data in the annual reports, extracting key phenomena and patterns. They then integrate these phenomena and patterns to construct the main factors involved in the enhancement of dynamic capabilities within enterprises. Finally, the study examines the commonalities and differences in the digital transformation process of groups to propose theoretical conclusions with universal and practical significance.

4. Case Analysis

4.1. Text rooted analysis based on the Lighthouse factory annual report

Through the text analysis of the lighthouse factories annual reports, the relationships among resource factors, dynamic capabilities, and enterprise performance are obtained as shown in Table 1.

Table 1. Sample table of text analysis

Original statement and coding	**Keywords**	**Concept construction**	**Dynamic capability**	**Enterprise performance &concept construction**
The "Intelligent Manufacturing New Technology R&D and Application Project", "Intelligent Manufacturing Industry Upgrading Project" and "Intelligent Manufacturing Capacity Expansion Project" are mainly carried out through new technology R&D and application, production equipment upgrading, technological transformation and upgrading, and intelligent construction (Foxconn - 23 - 4).	Intelligent manufacturing, new technology research	technology	identification and perception of resource elements	innovative performance—innovative product
An energy manager makes it possible to visualize, analyze, and evaluate the efficiency of a building's energy supply, distribution, and consumption. The potential savings identified and specific actions derived allow CO2 emissions and energy costs to be deliberately reduced and resources to be conserved(bosch-23-63)	Digital, energy costs to be deliberately reduced	technology	identification and perception of resource elements	sustainable competitive advantage enterprise ESG
The company's institutional decision-making procedures and mechanisms such as the articles of association and shareholder return plans are complete and compliant, the process is open and transparent, and the dividend standards and proportions are clear. (Haier 9-1)	System decision-making procedure, mechanism	Internal policy and institutional support	identification and perception of resource elements	financial performance
Key pollutant-discharging units shall, in accordance with the requirements of relevant laws and regulations, improve the environmental protection responsibility system. (Huayi New Materials 287 - 4)	Laws and regulations, institutions	External policy and institutional support	integration and organization of resource elements	Sustainable competitive advantage - ecosystem construction
In vestments by the company, which operates in the market as Bosch Ventures, focus on projects involving artificial intelligence, digitalization, mobility solutions, and future computer technologies. In the 2023 reporting year, Bosch	Digitalization, AI, mobility, computer technologies	technology	identification and perception of resource elements	Sustainable Competitive Advantage - Digital transformation

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Ven tures invested in startups in fields including generative AI, quantum computing, robotics, energy-efficient chip cooling, AI-based logistics management, and antenna technologies.(Shibo-23-65)				
Grasp the changes in organizational learning models in the context of digital technologies such as artificial intelligence, big data, and cloud technology. (Haier 15 - 3)	Cloud technology, digital technology, artificial intelligence	technology	innovation and reconfiguratio n of resource elements	Sustainable Competitive advantage - Digital transformation
SAIC Motor is vigorously promoting the new energy vehicle business and facilitating the construction of zero-carbon factories and carbon reduction throughout the vehicle's life cycle. (SAIC 29-2)	New energy, zero-carbon, carbon reduction	Internal policy, technology	integration and organization of resource elements	Sustainable competitive advantage - ecosystem construction
Utilize the digital information system to form a closed-loop management system for the entire value chain from business opportunities to payment collection, and enhance the ability to acquire and convert business opportunities. (Midea - 23 - 20)	Digitalization, information systems, full value chain	technology	integration and organization of resource elements	Innovation performance - Innovation business model
Midea uses digital technology to directly connect with a wide network of small and medium-sized retailers, continuously optimizing the sales channel network. Through the "Midea Cloud Sale" platform, small and medium-sized retailers can directly order products and promote the sales of structural products and new products. (Midea - 23 - 10)	Digital technology, connected retailer network, "US cloud sales" platform	technology	integration and organization of resource elements	Sustainable Competitive Advantage - Supply chain synergy
Comprehensively upgrade data empowerment, enrich big data application scenarios. A number of big data applications such as carbon data management and four-base process quality management have been successfully put into operation. (Baosteel - 22 - 29)	Data carbon data	data	integration and organization of resource elements	Innovation Performance - Innovation Platform
Based on the Manufacturing Operations Management platform (MOM), with multiple digital systems such as the Workshop Management System (WMS), the Advanced Planning and Scheduling system (APS), and digital twins as auxiliaries, an "intelligent brain" for factory production is formed. (Sany Group - 23 - 8)	Operations Management, Systems, digital systems	technology	identification and perception of resource elements	Sustainable Competitive Advantage - Digital transformation

At the enterprise performance level, sustainable competitive advantages encompass the efforts made by enterprises in ecosystem construction, digital transformation, supply chain collaboration, and enterprise ESG. Innovation performance includes the efforts of enterprises in innovative products, innovative product chains, innovative systems, innovative business models, and innovative platform construction. Financial performance mainly refers to the comprehensive manifestation of operating results, financial status, and cash flow reflected by financial data within a certain period. It is an important tool for internal enterprise management and a crucial basis for external investors, creditors, and other stakeholders to evaluate enterprise value and risk. In this study, the concept is not further refined.

At the dynamic capability level, efforts are made in the identification and perception of resource elements, the integration and organization of resource elements, and the innovation and reconfiguration of resource elements. Internal and external resource elements include technology, internal policy and institutional support, external policy and institutional support, and data resources.

In the process of corporate digital transformation, the construction of resource elements is crucial.

The text analysis extracted keywords related to technological elements, which include: digital technology, technology application, AI technology, mobile technology, 5G technology, technological innovation, Industry 4.0 technology, Internet technology, technology development, information technology, new technologies for intelligent manufacturing, and technological transformation and upgrading. Data resource elements are the core assets of digital transformation. The text analysis extracted keywords related to data resource elements, which include: digital transformation, information platform, automation systems, management systems, big data analytics, intelligent services, data acquisition, data value, data sharing, data management, data systems, and big data support, all of which provide strong support for the transformation. Internal institutional support elements provide a solid internal management guarantee for the transformation. The text analysis extracted keywords mainly

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covering: institutional decision-making procedures, centralized management model, implementation plans, incentive mechanisms, performance evaluation system, responsibility protection system, joint document system, management control system and system, cost control management system, and cost reduction incentive policy. The text analysis of external institutional support extracted keywords mainly covering: legal system, regulatory system, exchange rate system, legal and regulatory requirements, unified national accounting system, national energy storage support policies, national policy issuance, and legal provisions. These resource elements are interrelated and work in synergy to jointly promote the digital transformation process of enterprises (Table 2).

Table 2. Extraction of Resource Elements and Keywords

The Constructed Concept of Resource Elements	**Keywords**
Technical Resources	Digital technology. Technology application, AI technology, mobile technology, 5G technology, technological innovation, Industry 4.0 technology, Internet technology, technology development, information technology, new technologies for intelligent manufacturing, technological transformation and upgrading, ...
Data Resources	Digital Transformation, Information Platform, Automation Systems, Management Systems, Big Data Analytics, Intelligent Services, Data Acquisition, Data Value, Data Sharing, Data Management, Data Systems, Big Data Support, ...
Internal Policy and Institutional Support	Institutional decision-making procedures, centralized management model, implementation plans, incentive mechanisms, performance evaluation system, responsibility protection system, joint document system, management control system, cost control management system, cost reduction incentive policy, ...
External Policy and Institutional Support	Legal system, regulatory system, exchange rate system, legal and regulatory requirements, unified national accounting system, national energy storage support policies, national policy issuance, legal provisions, ...

4.2. Research Results

In terms of the process of realizing dynamic capabilities through factor utilization to enhance enterprise performance, based on the data table constructed with the concept of grounded theory, the relationships among enterprise resource factors, dynamic capabilities, and performance improvement are analyzed.

(1) Relationship between technological resource factors and dynamic capabilities and performance improvement

There are 215 technological resource factors. 115 of them are associated with "identification and perception of resource elements", and 53 are about "enterprise digital transformation" to enhance "enterprise sustainable competitive advantage". For example, Midea's 2023 annual report mentions "Utilizing 'building equipment and facilities + digital technology + industrial ecosystem layout' to connect the traffic flow, information flow, experience flow, and energy flow of the building, empowering the building with digital and low-carbon technologies, and jointly building a sustainable smart space (Midea - 23 - 2)". The keywords "digital technology" and "low-carbon technology" represent technological elements, "connect the traffic flow, information flow, experience flow, and energy flow of the building" reflects the introduction of digital technology from scratch, which is the "identification and perception of resource elements" in dynamic capabilities, and "jointly building a sustainable smart space" reflects that the enterprise conducts digital transformation to enhance sustainable competitive advantage.

There are 62 items associated with "integration and organization of resource elements", among which 17 are about "enterprise digital transformation" and 13 are about "enterprise ecosystem construction". Therefore, "digital transformation" and "ecosystem construction" are used to enhance "enterprise sustainable competitive advantage". For example, Sany Group's 2023 annual report mentions "Breaking through more than 140 key technologies such as fully automatic cutting and blanking, robot welding/assembly, one-key machining, robot spraying, and intelligent warehouse, realizing the transition from'machine-assisted people' to 'people-assisted machine' in processing operations and greatly improving the per capita operation efficiency (Sany Group - 23 - 7)". The keywords "robot welding" and "intelligent warehouse" represent technological elements, "realizing the transition from'machine-assisted people' to 'people-assisted machine'" reflects the update and improvement of digital technology, which is the "integration and organization of resource elements" in dynamic capabilities, and "greatly improving the per capita operation efficiency" reflects that the enterprise conducts digital transformation to enhance

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sustainable competitive advantage. Also, Taiyuan Heavy Industry's 2023 annual report mentions "The digital process, procurement, manufacturing, sales, and integrated management platform of industry and finance has been integrated and connected in 9 units such as the procurement center, processing and distribution center, and crane (Taiyuan Heavy Industry - 23 - 3)". The keyword "digital process" represents a technological factor, "digital" reflects the update and improvement of digital technology, which is the "integration and organization of resource factors" in dynamic capabilities, and "integrated and connected" reflects that the enterprise conducts ecosystem construction to enhance sustainable competitive advantage.

There are 37 items associated with "innovation and reconfiguration of resource factors", among which 14 are about "enterprise digital transformation" to enhance "enterprise sustainable competitive advantage". For example, Haier's 2023 annual report mentions "Utilizing the global factory sharing and co-creation to develop intelligent manufacturing technology and continuously enhance manufacturing competitiveness. (Haier 87 - 3)". The keyword "intelligent manufacturing technology" represents a technological factor, "sharing and co-creation" reflects a major innovation measure of digital technology, which is the "innovation and reconfiguration of resource factors" in dynamic capabilities, and "continuously enhance manufacturing competitiveness" reflects that the enterprise conducts digital transformation to enhance sustainable competitive advantage.

Therefore, the most important thing is to obtain technological resource factors to realize "integration and organization of resource factors" and improve the performance of "enterprise digital transformation". Secondly, it is to realize "identification and perception of resource factors" to improve the performance of "enterprise digital transformation".

(2) Relationship between data resource elements and dynamic capabilities and performance improvement

There are 72 data resource factors. Among them, 35 are associated with the identification and perception of resource elements, and 16 are about "enterprise digital transformation" to enhance "enterprise sustainable competitive advantage". For example, Danfoss's 2023 annual report mentions "The target attainment for each individual performance criteria ranges between 0% and 200%. Settlement of the awards is in shares corresponding to the actual target attainment." The keywords "condition/eligible employees/management", "0% and 200%" represent data elements, which is the "identification and perception of resource elements" in dynamic capabilities, and "Settlement of the awards is in shares corresponding to the actual target attainment" reflects that the enterprise conducts digital transformation to enhance sustainable competitive advantage.

Among the 72 data resource elements, 31 are associated with the integration and organization of resource elements, and 17 are about "enterprise digital transformation" to enhance "enterprise sustainable competitive advantage". For example, Midea's 2023 annual report mentions that in intelligent manufacturing, using digital technology, Midea is committed to building a high-quality, flexible, green and efficient production factory (Midea - 23 - 9). The keywords "digital technology", "high-efficiency", "high-quality", "flexible", "green and efficient production factory" represent data elements, which is the "integration and organization of resource elements" in dynamic capabilities, and "using digital technology in intelligent manufacturing" reflects that the enterprise conducts digital transformation to enhance sustainable competitive advantage.

Among the 62 data resource factors, 4 are associated with the innovation and reconfiguration of resource factors, and 4 are about "enterprise digital transformation" to enhance "enterprise sustainable competitive advantage". For example, the software technology and open platform communication universal architecture further optimize the integration and plug-and-play convenience of the robot (Midea - 23 - 3). The keywords "software technology and open platform communication universal architecture" represent data elements, which is the "innovation and reconfiguration of resource elements" in dynamic capabilities, and "further optimize the integration and plug-and-play convenience of the robot" reflects that the enterprise conducts digital transformation to enhance sustainable competitive advantage.

Therefore, the most important thing is to obtain technological resource elements to realize the identification and perception of resource elements and improve the performance of enterprise sustainable competitive advantage. Secondly, it is to realize the integration and organization of resource elements to improve the performance of enterprise sustainable competitive advantage.

(3) The Relationship Between Internal and External Institutional Resource Elements and Dynamic Capabilities and Performance Enhancement

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There are a total of 115 internal and external corporate policy and institutional elements, of which 19 are related to external corporate policies and institutions, accounting for approximately 16.5%, while 97 are related to internal corporate policies and institutions, accounting for approximately 84.3%.

In the section on external corporate policies and institutional elements, there are 11 items related to the "identification and perception of resource elements," of which 6 pertain to the improvement of corporate "financial performance" due to external policy support. For instance, in the 2023 annual report of Sany Heavy Industry, it is mentioned that "this change in accounting policy is made in accordance with the requirements of laws and regulations or the unified national accounting system." The key terms "unified national" and "policy" reflect that this is an external corporate policy and institutional element. The term "change" indicates the transition of the policy from non-existence to existence, which is the "identification and perception of resource elements" in dynamic capabilities. The term "accounting policy" reflects the impact of external policies on the "financial performance" of the enterprise.

In the section on internal corporate policies and institutional elements, there are 65 items related to the "identification and perception of resource elements," of which 16 pertain to "innovation systems" aimed at enhancing corporate "innovation performance." For example, in Haier's 2023 annual report, it is mentioned that "the company uses automation, information technology, and centralized management models to implement centralized dynamic monitoring and digital management of major energy consumption such as water, electricity, and gas in all factories nationwide." The key terms "monitoring" and "management" reflect that this is an internal corporate policy and institutional element. The term "implementation" indicates the introduction of automation, information technology, and centralized management models from non-existence to existence, which is the "identification and perception of resource elements" in dynamic capabilities. The term "centralized dynamic monitoring and digital management" reflects the company's efforts to implement an innovation system to enhance innovation performance. Additionally, there are 16 items related to "corporate digital transformation" aimed at enhancing "sustainable competitive advantage." For example, in the 2023 annual report of Western Mining Co., Ltd., it is mentioned that "the company vigorously implements measures of 'mechanization replacing manpower, automation reducing manpower, and intelligent unmanned operations.' The comprehensive recovery equipment and technology for copper, lead, and zinc smelting have reached an industry-leading level. By strengthening mineral processing experimental research and improving operational management in aspects such as reagents, grinding, and liberation, the company has achieved year-on-year improvements in mining indicators, with mining and mineral processing technologies ranking at the forefront of the industry." The key terms "company" and "management" reflect that this is an internal corporate policy and institutional element. The term "implementation" indicates the introduction of technology from non-existence to existence, which is the "identification and perception of resource elements" in dynamic capabilities. The terms "automation" and "intelligence" reflect the company's efforts to implement digital transformation to enhance sustainable competitive advantage.

There are 21 items related to the “integration and organization of resource elements,” of which 7 pertain to “ecosystem construction” aimed at enhancing the “sustainable competitive advantage” of enterprises. For example, in Siemens’ 2023 annual report, it mentions that “Digital Industries offers a comprehensive product portfolio and system solutions for automation used in discrete and process industries. It provides process control systems, machine-to-machine communication products, sensors and radio frequency identification systems, production and product lifecycle management (PLM) software.” The key terms “portfolio” and “industries” reflect that this is an internal corporate policy and institutional element. The keyword “provides” and others indicate the renewal and enhancement of factories, which is part of the “integration and organization of resource elements” in dynamic capabilities. The terms “discrete and process industries” and “machine-to-machine communication” reflect the company’s efforts in ecosystem construction to enhance sustainable competitive advantage.

There are 11 items related to the "innovation and reconfiguration of resource elements," of which 8 pertain to the "digital transformation of enterprises" aimed at enhancing the "sustainable competitive advantage" of enterprises. For example, in the 2023 annual report of Guangzhou Automobile Group (GAC), it mentions that "GAC Passenger Vehicle continues to consolidate and expand the marketing 'Golden Triangle' digital sales and service system, introducing a smart store system, implementing 'companion-style' services, and establishing a dedicated new energy team to create a new sales model for Trumpchi's new energy vehicles. To date, 140 new energy experience stores have been built. GAC Trumpchi has won the dual first place in J.D. Power's 2023 After - sales Service Satisfaction (CSI) and Sales Service Satisfaction (SSI) among Chinese domestic brands." The key terms "expanding marketing" and "store system" reflect that these are internal corporate policy and institutional elements. The keywords "creating" and "introducing" indicate significant innovative measures, which are part of the

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"innovation and reconfiguration of resource elements" in dynamic capabilities. The term "smart store" reflects the company's efforts in digital transformation to enhance sustainable competitive advantage.

In conclusion, the most important aspect is to obtain internal corporate policies and institutional elements to realize the identification and perception of resource elements. This is primarily accomplished through digital economic transformation to enhance the company's sustainable competitive advantage and through innovation systems to improve the company's innovation performance. The second priority is to achieve the integration and organization of resource elements, by constructing an ecosystem to enhance the company's sustainable competitive advantage performance.

Figure 5 illustrates the framework for how lighthouse factories achieve enhanced corporate performance through dynamic capabilities from a resource perspective. From left to right, the first part consists of internal and external resource elements, including technological resources, data resources, external policy and institutional support, and internal policy and institutional support. These are the foundational resources available to the enterprise. The middle part represents dynamic capabilities, which are divided into the identification and perception of resource elements, the integration and organization of resource elements, and the innovation and reconfiguration of resource elements. These capabilities enable the enterprise to process and utilize resources effectively. The far right side shows corporate performance, which includes sustainable competitive advantage, financial performance, and innovation performance. These are the desired outcomes that enterprises aim to achieve. In this framework, internal and external resource elements serve as the foundation, while dynamic capabilities act as the bridge that transforms resources into corporate performance, thereby facilitating the sustainable development and excellent performance of lighthouse factories.

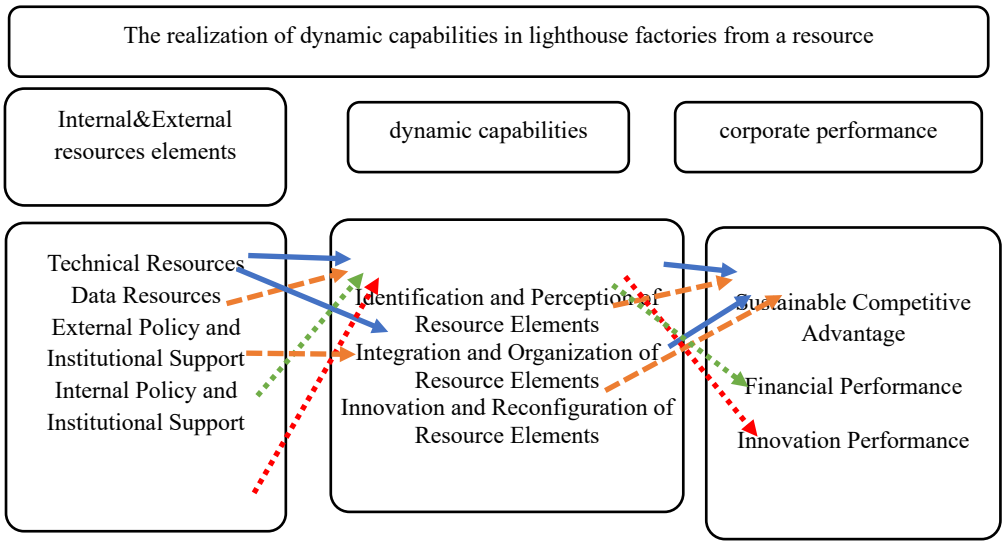

Figure 5: Analysis Results of the Dynamic Capability Realization of Lighthouse Factories from a Resource Perspective to Enhance Corporate Performance

It can be concluded that technological elements and data resource elements primarily enhance the sustainable competitive advantage of enterprises through the "identification and perception of resource elements" and the "integration and organization of resource elements." Support from external policies and institutions mainly improves the financial performance of enterprises through the "identification and perception of elements." Support from internal policies and institutions within the enterprise mainly enhances the overall innovation performance of the enterprise through the "identification and perception of resource elements."

From the case studies of lighthouse factories, it has been found that enterprises lack the dynamic capability to shape the application of resource elements at the level of "innovation and reconfiguration of resource elements." Therefore, in the future, it is necessary to pay more attention to the potential value of resource elements and continuously deepen the innovation and reconfiguration of these elements in order to enhance the efficiency of resource utilization.

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5. Research Conclusions and Recommendations

In the surging tide of the booming digital economy, digital transformation has become the core driving force for enhancing corporate performance. Lighthouse factories, through continuous exploration and practice, have demonstrated a clear direction for other enterprises.

(1) Strengthen the construction of dynamic capabilities, especially the enhancement of the ability to innovate and reconfigure resource elements.

During the process of corporate transformation and upgrading, lighthouse factories have demonstrated that strengthening the construction of dynamic capabilities is the key to enhancing corporate adaptability and competitiveness. In the process of digital transformation, lighthouse factories optimize the allocation of resources, improve resource utilization efficiency, reduce operating costs, and ensure their leading position in fierce market competition. By using advanced technologies, lighthouse factories accurately allocate various resources in the production process, carry out innovation and reconfiguration, and maximize the value of resources.

(2) Enhance Market Responsiveness and Innovation Capability

The continuous development of an enterprise relies on a constant source of driving force. Strengthening market responsiveness and innovation capability is the key to sustaining corporate development. Lighthouse factories establish innovation incentive mechanisms to encourage employees to propose innovative ideas and promote the transformation and application of innovation outcomes. They build a unique competitive advantage through differentiation strategy and brand building. By leveraging digital technologies, lighthouse factories can quickly capture market changes, adjust production strategies, and launch innovative products and services that meet market demands.

(3) Strong Dynamic Capabilities in Resource Utilization for Sustainable Development and Innovation Management

In a highly competitive and uncertain market environment, lighthouse factories leverage their strong innovation capabilities to develop products and services with unique competitive advantages, differentiating themselves from competitors. With their robust digital operations systems, they can respond swiftly and effectively mitigate risks. Digital transformation is an effective pathway to a leap in performance and can achieve sustainable development for enterprises. The practices of lighthouse factories indicate that enterprises should actively promote the digital economy to shift towards standardization and inclusive sharing. Meanwhile, enterprises should deepen their digital transformation and build a fully integrated digital information-sharing platform, which not only reduces the cost of information dissemination but also enhances the collaborative efficiency between different segments of the industrial chain.

Based on the research conclusions mentioned above, it can be seen that lighthouse factories are able to successfully embark on the path of digital transformation and provide valuable experience for a wide range of enterprises. Companies should learn from the model of lighthouse factories, actively promote digital transformation, strengthen the construction of dynamic capabilities, continuously enhance their own competitiveness, and achieve sustainable development and innovation management in the digital economy era.

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