Development Strategies of Smart Manufacturing for Chinese Enterprises Based on SWOT Analysis

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ABSTRACT

Against the backdrop of rising labor costs and declining traditional cost advantages in China's manufacturing industry, smart manufacturing has become a core driving force for industrial upgrading and a key approach to helping domestic enterprises break through the middle-income trap. This paper first defines the connotation, core technologies and advantages of smart manufacturing, and expounds the relationship between smart manufacturing and corporate strategic layout. On this basis, a SWOT analysis is conducted to summarize the strengths, weaknesses, opportunities and threats faced by Chinese enterprises in the process of intelligent transformation, and corresponding SO, ST, WO and WT strategies are proposed. Taking Huawei and Xiaomi as typical cases, this paper compares their different development models, strategic layouts and practical dilemmas in smart manufacturing.

Keywords: *Smart manufacturing, Corporate strategy, SWOT analysis, Enterprise transformation, Huawei, Xiaomi.*

1. INTRODUCTION

According to data from the National Bureau of Statistics, labour costs in China's manufacturing sector are expected to rise by 217% by 2022 compared with 2010. At the same time, the density of industrial robots is forecast to increase over the same period from 15 units per 10,000 inhabitants to 322 units per 10,000 inhabitants. This contradiction highlights the urgency of transforming and modernising China's manufacturing sector. In the Boston Consulting Group's Global Manufacturing Competitiveness Index, China has fallen from first place in 2016 to third place in 2023, suggesting that its traditional cost advantage is being overtaken by Southeast Asian countries. The implementation of Industry 4.0 in Germany and the Industrial Internet in the US demonstrates that smart manufacturing is reconfiguring the industrial value chain through technological integration. This is of particular strategic importance for Chinese companies caught in the "middle-income trap".

2. BASIC DEFINITION

This subsection provides fundamental standard interpretations of core research concepts, laying theoretical groundwork for subsequent analytical discussions.

2.1 Smart Manufacturing

Smart manufacturing is an advanced production model based on highly integrated, data-driven and adaptive optimisation.

2.1.1 Definition

The smart manufacturing industry has its roots in the manufacturing and logistics sector, which is crucial to the emergence and sustainability of an innovation-driven economy. The manufacturing sector can support innovation activities, promote the industrialisation of innovative products and services, and drive the innovation cycle forward. Smart manufacturing is an advanced production model based on highly integrated, data-driven and adaptive optimisation. The integration of technologies such as cyber-physical systems, the

Industrial Internet of Things, artificial intelligence, big data analytics, cloud computing and digital twins is crucial to achieving real-time awareness, dynamic decision-making and precise execution of the entire manufacturing process. The core of the model lies in the deep integration of these technologies, which enables real-time awareness, dynamic decision-making and precise execution of the entire manufacturing process. [1]

2.1.2 Meaning

The term “smart manufacturing” refers to the use of information and communication technologies in production with the aim of maximising resource efficiency and process efficiency. The relevance of smart manufacturing: reinventing the driving force behind the global manufacturing industry.

In view of the increasing intensity of international competition and growing restrictions regarding resources and the environment, global competitive conditions are becoming significantly more challenging. Smart manufacturing, a technological paradigm of the Fourth Industrial Revolution, is driving a transformation in the manufacturing industry from a focus on scale optimisation to a value-oriented approach. The relevance of smart manufacturing is not limited to the optimisation of production efficiency. Smart manufacturing encompasses not only the linear improvement of production efficiency, but also the profound integration of data, technology and systems. This configuration affects manufacturing logic, industrial ecology and human collaboration. The term “smart manufacturing” therefore refers to the incorporation of state-of-the-art technologies such as artificial intelligence, the Internet of Things, robotics and data analysis into the various stages of the manufacturing process, with the aim of achieving full automation. [2]

2.2 Corporate strategy

Corporate strategy is a systematic long-term plan for enterprises to achieve long-term goals.

2.2.1 Definition

Corporate strategy is defined as a comprehensive and systematic plan formulated by a company to achieve long-term objectives, encompassing the direction of development, resource allocation, competitive strategy and the development of core competencies. Its significance can be summarized as follows:

A clear direction is pursued, which manifests itself in the standardisation of organizational measures. This serves to prevent the waste of resources. A company’s competitiveness can be enhanced in various ways. For instance, a specific market position can be achieved through appropriate differentiation or cost advantages. Coping with uncertainty requires dynamic adaptation to external changes, such as those driven by technology and politics.

It is essential to drive the innovation process forward. The modernisation of technologies and management models, such as the transition to smart manufacturing, is of crucial importance in this regard.

2.2.2 Definition

Smart manufacturing is characterized by three key features: intensive use of factors of production, complex production processes and economies of scale. The smart manufacturing industry thus plays a significant role in driving innovation and makes a major contribution to the industrial application of innovative products and services. It is one of the sectors most actively engaged in innovation. The growth rate of total factor productivity in the smart manufacturing industry exceeds that of other sectors. Rapid technological advances in the manufacturing sector are making it a major driver of innovation.

2.2.3 Developing the Corporate Strategy

Traditional frameworks for strategy development: Firstly, it should be noted that a wide range of aspects must be taken into account during the environmental analysis. These include political, economic, social, technological, environmental and legal factors. For internal assessment, the SWOT analysis and the value chain analysis can be utilized. Objectives can be set in accordance with the SMART principle.

Potential approaches include cost leadership, differentiation, the focus strategy and others. Strategic upgrading and smart manufacturing. Within the context of global technological competitiveness, the implementation of smart manufacturing technology into strategy-driven technology is a key factor that plays a decisive role in technological development. The agile decision-making mechanism shortens the time required to implement strategies, as it collects and analyses data in real time.

2.2.4 Element of Corporate Strategy

Corporate strategy is defined as a comprehensive and systematic plan formulated by a company to achieve long-term objectives, encompassing the direction of development, resource allocation, competitive strategy and the development of core competencies. Its relevance is evident in several respects: a clear direction, characterized by the standardization of organizational measures and the avoidance of wasted resources. Increased competitiveness, achieved by securing a market position through differentiation or cost advantages. Coping with uncertainty, ensured by dynamic adaptation to external changes, such as technology and politics. The promotion of innovation includes promoting the modernization of technologies and management models, such as the transition to smart manufacturing. In the wake of the current Fourth Industrial Revolution, industry is becoming smarter through the implementation of digital technologies. The focus is therefore on generating sustainable benefits. Smart technologies such as machine learning, big data analytics, additive manufacturing and the Internet of Things contribute to the effective use of resources and the minimization of waste, thereby contributing to sustainability in manufacturing. This chapter therefore highlights the importance of smart manufacturing by identifying various technologies used in industry to integrate smart features. [3]

3. SWOT ANALYSIS

SWOT analysis is a standard strategic tool assessing internal strengths, weaknesses and external opportunities, threats to support corporate strategic planning.

3.1 Definition

The SWOT analysis is a structured analytical tool used to assess the internal and external environment of an organization, a project or an individual. Within this framework, four key elements are identified to inform strategic decision-making.

First, we should define what is meant by the term “SWOT analysis”. SWOT is an acronym for the English terms Strengths, Weaknesses, Opportunities and Threats. The analysis focuses on the individual consideration of these aspects and their interplay in the context of further application.

3.2 Objectives

The preparatory work for the actual SWOT analysis begins with defining the fundamental objective. An effective analysis is only possible if the relevant data relates to a clearly defined objective. For example, increasing turnover is only of limited use as an objective, whereas increasing sales of a specific product can significantly enrich the analysis.

It is advisable for the whole team to collaborate on the creation of a SWOT analysis. This ensures that all factors are captured from various perspectives and analyzed as precisely as possible. It is recommended to develop questions that target the individual SWOT factors.

Once the full analysis of all factors has been completed, the relevant points are combined in accordance with the specified methodology. This evaluation results in strategies that support the objectives set in advance. Following the implementation and application of these strategies, a monitoring phase is required. The relevant key performance indicators are used for this purpose.

3.3 Strategies

SO Strategy: Chinese companies have enhanced their technological innovation capabilities in the field of smart manufacturing and benefit from strong market demand and policy support. Given the growth of emerging markets and the trend towards digital modernization, companies should increase their investment in research and development of advantageous technologies and improve product performance and quality. At the same time, they should leverage policy and industry-specific synergies to accelerate digital transformation, integrate resources, consolidate the domestic market and expand into overseas markets.

ST Strategy: Although companies have advantages, they face threats from intensified international competition, rapid technological innovation and trade protectionism. Companies should continue to focus on cutting-edge technologies and increase investment in research and development to maintain technological leadership. They should leverage the economies of scale accumulated in the domestic market, optimize cost structures, strengthen brand building and improve international competitiveness. They should develop diversified overseas markets through

international cooperation platforms to reduce market dependency.

WO Strategy: Chinese companies face the problem of a weak technological base, insufficient capacity for innovation and a shortage of highly skilled workers. However, the trend towards digital transformation and the increase in international cooperation offer opportunities. Through international partnerships, companies can bring in advanced technologies and expertise to enhance their independent innovation capabilities. At the same time, they can use international cooperation to attract talent and collaborate with universities and research institutions to improve the talent training system.

WT Strategy: In view of the shortcomings in technology and talent, as well as the threats posed by market competition and the trading environment, companies must strengthen their internal management, optimize cost control and improve their risk-bearing capacity. Investment in technological research and development, as well as in joint research and development with peers, should be increased, and dependence on imports should be eliminated. As regards talent, treatment should be improved and collaboration with vocational schools established for staff training. In the market: intensifying research, market segmentation, providing tailored services, developing the domestic market and reducing the impact of fluctuations in the international market. [4]

4. EXAMPLES OF COMPANIES

Driven by the vibrant domestic market and digital economy, Chinese enterprises have achieved remarkable development. Several typical companies are analyzed as follows.

4.1 Huawei

Founded in 1987, Huawei is a top global ICT infrastructure and smart device supplier with heavy R&D input, operating across over 170 regions worldwide.

4.1.1 Background

Empirical evidence supports the hypothesis that it is advisable to avoid areas of risk or to counter them using one's own strengths. Where this is not possible, it is recommended that weaknesses be addressed through appropriate measures. The development of a polycentric urban landscape is a defining feature of urban expansion in China, as can be seen, for example, in the core business districts of Financial Street, the Central Business District and Zhongguancun. The consumer goods market is of considerable size. In 2022, total turnover reached 1.37 trillion yuan. At the same time, the Chinese capital, Beijing, is stepping up the development of an international consumer hub, with more than 40% of this urban area earmarked for the digital economy. Furthermore, the business environment is being continuously optimized.

4.1.2 Analysis of Huawei Using SWOT Analysis

As part of the intelligent transformation of the global manufacturing industry, Huawei, as a representative of Chinese technology companies, has demonstrated unique technological advantages, but also faces numerous challenges from both within and without. Huawei's development trajectory clearly highlights the opportunities and challenges facing Chinese companies in the field of smart manufacturing.

The intertwining of advantages and opportunities: Huawei's core competence lies in the deep integration of communication technology and artificial intelligence, and its high-speed, low-latency 5G networks, combined with its self-developed AI chips and cloud computing capabilities, enable the company to offer manufacturing firms end-to-end solutions ranging from device connectivity to data analysis. This technological integration capability aligns with the modernization needs of China's manufacturing industry — the policy-driven "5G+Industrial Internet" strategy opens up a trillion-yuan market, particularly in new energy vehicles, smart devices and other emerging sectors, and Huawei has the opportunity to become a key setter of industry standards. Huawei has the opportunity to become a key setter of industry standards.

Impact of disadvantages and threats: However, Huawei's experience in traditional manufacturing remains limited. Complex production processes, process parameters and other specialist knowledge required in industrial settings demand long-term industry experience — precisely the strength of century-old industrial giants such as Siemens. At the same time, the uncertainty of the international environment creates a twofold pressure: The limited supply of high-end chips may compromise the stability of smart factory equipment, whilst the

system of industrial standards dominated by Europe and the US also poses an obstacle to overseas market expansion.

Huawei must focus on the three dimensions of technology integration, knowledge exchange and building security: Developing modular smart manufacturing solutions through 5G+AI to lower the threshold for transformation; building an industrial knowledge map in collaboration with the industrial chain to transform traditional experience; and promoting the substitution of domestically produced chips and a regional supply chain alliance to form a smart upgrading system that combines both offensive and defensive measures. [5]

4.2 Xiaomi

Founded in 2010 and listed in Hong Kong, Xiaomi is a leading consumer electronics firm focusing on smartphones and AIoT, with global business layout and persistent technological innovation.

4.2.1 Background of Xiaomi

Xiaomi Technology Co., Ltd. was founded on 6 April 2010 by Lei Jun in collaboration with Lin Bin, Huang Jiangji and seven other co-founders. The technology company's headquarters are located in Beijing. The company specializes in the production of smartphones and, as part of the "Internet model", pursues a novel value chain that replaces the traditional production chain. The MIUI operating system serves as the starting point for user participation in development through iteration. In 2011, the first Xiaomi mobile phone was launched; its price of 1,999 yuan had a disruptive effect on the market and introduced the product concept of "born for enthusiasts". The first Xiaomi mobile phone was launched in 2011 and disrupted the market with its groundbreaking price of 1,999 RMB. It introduced the product concept of "born for the enthusiasts".

The mission is to stimulate emotions and offer generous pricing. The company's focus is on making technology accessible to users worldwide. The company's cultural DNA combines the spirit of the internet with manufacturing practices.

4.2.2 Analysis of Xiaomi Using SWOT Analysis

On the new path towards the deep integration of consumer electronics and smart manufacturing, Xiaomi is charting a course of transformation with its unique ecosystem model, and its strategic choices reflect the defining characteristics of the convergence between internet DNA and traditional manufacturing.

The intertwining of advantages and opportunities: Xiaomi's core competitiveness lies in the rapid deployment of its smart hardware ecosystem. By investing in and incubating more than 400 companies in the ecosystem to form a production network, overlaid by the Mito platform connected to 500 million smart devices, a closed-loop data cycle has been established between the consumer side and the production side. This "demand-driven manufacturing" model aligns with the trend towards personalization—the 25% annual growth rate of the Chinese smart home market provides a testing ground for the flexible C2M production model, which represents a first-mover advantage in the sectors of smart small household appliances and wearable devices.

Implications of weaknesses and threats: However, the weaknesses of the green supply chain model are equally evident: core components remain dependent on international suppliers, such as Qualcomm chips and Samsung screens, and technological reserves in key areas such as semiconductors amount to less than a third of those held by Huawei. At the same time, the industrial software system required for smart manufacturing is not yet fully developed, and the coverage of the MES system in its own factories has only reached 60%, whilst the digital counter-offensive by traditional manufacturing giants such as Midea is constantly restricting its ecological space.

Xiaomi must establish a three-pronged approach comprising technological innovation, production synergy and risk mitigation: by focusing on investment in the research and development of core technologies such as sensors and energy management, and strengthening its capacity for independent innovation; by connecting the production lines of companies in the eco-chain to a unified industrial internet platform to achieve order aggregation and the sharing of production capacity; and by simultaneously partnering with chip manufacturers to establish an emergency supply chain and setting up regional production centers in Southeast Asia to create a dual safeguard mechanism comprising technological breakthroughs and risk diversification. Dual safeguard mechanism. [6]

5. CONCLUSION

This paper focuses on smart manufacturing, explains its definition and significance, and highlights that it is an advanced production method that integrates multiple technologies, constitutes a key paradigm of the Fourth Industrial Revolution, and drives the transformation of production value. According to the SWOT analysis, Chinese companies have technical, market-based and political advantages in the development of smart manufacturing, but also face threats such as international competition and rapid technological development. Huawei and Xiaomi are typical examples: Huawei excels in technological research and development but struggles with geopolitical and technological dependencies, whilst Xiaomi stands out for its eco-friendly product range but faces challenges in production and customer service. Both companies have formulated their development strategies in line with their own circumstances. In short: smart manufacturing is driving change in the Chinese manufacturing sector, and the strategic positioning of companies is crucial to the success or failure of digital transformation.

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