

Research on the Digital Transformation Business Model of the Automobile Manufacturing Industry

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Abstract: With the implementation of “Internet Plus” and “Made in China 2025” plans, China’s digital technology has developed rapidly, and the transformation to a digital direction is imminent for China’s manufacturing industry. In response to the national strategic deployment, many automobile enterprises have begun to carry out digital transformation. This article selects three representative Chinese automobile manufacturing enterprises and studies their business models through case analysis. This paper summarizes automobile enterprises’ digital transformation business model from six aspects: product production, user service, marketing methods, and business processes. This paper has promoted the theoretical development of the digital transformation of the manufacturing industry, especially the automobile manufacturing industry. At the same time, it provides practical business model suggestions for the digital transformation of Chinese automobile manufacturing enterprises.

Keywords: automobile manufacturing industry, digital transformation, business model, FAW Group

1. Introduction

Since introducing “Internet Plus” and “Made in China 2025” plans, the rapid popularization of new AI, Internet, cloud computing, and other advanced technologies have promoted cross-field collaborative innovation in the manufacturing industry and moved towards digital, networked, and intelligent development. In the environment of Digital transformation, the global competitiveness pattern of enterprise groups and competitive industries has changed, consumer consumption standards and quality needs have upgraded, and new business models and formats of enterprises are emerging. Due to the emergence of the global “manufacturing industry return” and “middle-income trap”, China’s traditional low-cost manufacturing advantages are gradually being replaced by emerging low-cost manufacturing countries, and economic transformation is urgent. The transformation towards intelligent manufacturing is currently an opportunity and challenge for China’s manufacturing industry, and the automotive manufacturing industry is the “vanguard” of the entire manufacturing industry. With the implementation of “Made in China 2025”, many automobile manufacturing enterprises are striving to leap from traditional manufacturing management mode to digital and intelligent to meet the needs of the domestic market. Therefore, studying the Digital transformation of the automobile manufacturing industry will positively impact the manufacturing industry and China’s economic development. This paper selects three representative Chinese automobile manufacturing enterprises, FAW, BAIC

Group, and Geely Automobile, to study the business model of Digital transformation of the automobile manufacturing industry through case analysis. This article provides a literature review in Chapter 2. The third chapter of this paper selects typical enterprises in China's automobile manufacturing industry to describe the case of Digital transformation. Chapter 4 conducts specific analysis and research on the business model of the case. Chapter 5 concludes.

2. Literature Review

At present, academia has conducted much research on Digital transformation, regarding the connotation of Digital transformation, Jansson and Andervin proposed in the book *Leading Digital Transformation* that Digital transformation is an important means for enterprises to achieve self-adjustment and development in the digital environment, which can help enterprises better adapt to the new market environment [1]. On the content and process of Digital Transformation, Dr- Ing Uwe Winkelhake emphasizes that automakers should take swift action to reposition their corporate strategy and fundamentally challenge long-standing business models, processes, and organizations to achieve electronic transformation. In the digital age, the academic community is actively exploring the transformation of models and researching them [2]. There is also corresponding research in the academic community on transforming business models in the digital age. Bermans and Bellr believe there are three ways to achieve business model transformation in the digital age: the first path focuses on reshaping customer value requirements. The second path focuses on transforming the business operation model. The third path is re-engineering capabilities around the abovementioned approaches: customer value requirements and operational models [3]. R.I. Makarov and E.R.Khorosheva pointed out in their article "Outstanding aspects of implementing a digital economy in Russian glass factories" that Industry 4.0 technology can help optimize and organize basic production and control of business-related processes [4]. For the Digital transformation of the automobile manufacturing industry, American scholars Tim Kessler and Christoph, after studying the development model of the automobile industry OEM manufacturers, thought that they should follow the example of Apple or Google and other IT companies, which update their "operating systems" every few weeks [5]. Its essence is the innovation of business models brought about by the transformation of digital models. Bernhard Thiez, with the support of the European Union National Standards Committee (CEN) and the European Union National Standards Committee for Electronic Products (CENELEC), proposed a "facing the future" national standards framework for promoting digital technology transformation, providing an essential reference for national standards work worldwide [6]. Dr. Qiu mentioned that modern digital information technology could establish a complete manufacturing industry chain system and achieve organic integration of informatization, industrial intelligence, and network [7].

3. Case Study on Digital Transformation of the Automobile Manufacturing Industry

3.1. FAW Group

FAW Group has established a data-based collaborative design and modeling platform to support various technologies and provide a perfect workflow. This platform can help companies quickly complete multiple tasks and significantly reduce product manufacturing time to 6 months or less. Especially in intelligent vehicles, FAW Group has established an internationally leading four major data processing platforms that can support various technologies, including model building, testing, analysis, and evaluation. FAW Group uses the 5G+industrial Internet to build a digital factory that perfectly integrates the four major processes of stamping, welding, painting, and final assembly. Using the 5G+hybrid reality technology, it can conduct real-time monitoring of various processes, as well as positioning and maintenance of equipment, significantly improving the quality of the process and the efficiency of work. The ERP system launched by FAW Group has perfect autonomy and operability,

making the business process of the entire enterprise more efficient and convenient, significantly improving the overall operational efficiency of the enterprise [8].

3.2. BAIC Group

BAIC Group has realized the digitalization of internal production control and has possessed big data products such as financial accounting systems and financial management systems, which have recognized the integrated management of enterprise finance quickly and intelligently. In addition, BAIC Group has also achieved digitalization in the external industry and marketing management of the enterprise and has cooperated with Baidu Group. With the help of relevant core technologies of Baidu, BAIC Group has completed the interconnection between enterprise smartphones and car networks and enabled enterprise vehicles to assemble information and internet services to meet the needs of enterprises for vehicles on different occasions. At the same time, BAIC Group has also achieved product digitization and has obtained three national invention patents in terms of intelligent networking for vehicles: one is the 5G remote driving technology; The second is the remote management terminal technology for 5G smart vehicles; The third is a 5G smart electric vehicle, which can achieve new services such as vehicle information interconnection and vehicle road collaborative management. BAIC Group actively promotes service digitization and opens up online services. Through big data mining methods, it effectively controls the service requirements of vehicle consumers. It uses an intelligent butler's App to address various daily needs of customers for product selection, maintenance, and replacement. It also establishes a comprehensive community in the automotive industry through digital means, including brand services, social networking, and value chain discovery, fully covering the daily life scenarios of vehicle consumers [9]. The SWOT analysis of BAIC Group's digital transformation is shown in Table 1.

Table 1: SWOT Analysis of Digital Transformation of BAIC Group(continue).

<p>External Environment</p>	<p>Advantage</p> <p>1.Support for core technical capabilities, with R&D and manufacturing technology 2. Large market potential and high industry position</p>	<p>Inferiority</p> <p>1.Incomplete industrial chain structure and incomplete business coverage; 2. Quality issues</p>
<p>Internal Capabilities</p> <p>Opportunity</p> <p>1."Internet plus" technology is mature; 2. The government supports the automotive digital industry; 3. The market needs innovative products; 4. Enterprises are aware of industrial chain issues</p>	<p>SO Strategy</p> <p>1. Utilize the Internet to apply big data analysis to the industry, and build a digital industrial chain with technological advantages;2. Rely on government support to achieve digital innovation and development; 3. Using digital marketing to achieve a steady increase in sales; 4. Relying on technological advantages to enable intelligent networked vehicles</p>	<p>WO Strategy</p> <p>1. The government supports the development of the digital industry, providing opportunities for BAIC to strive to achieve the digital entire industrial chain; 2. While introducing new products, improve service quality and product quality to maintain enterprise competitiveness</p>

Table 1: (continued).

Threaten	ST Strategy	WT Strategy
1.The global market is shrinking; 2.Parts supply chain interruption; 3.High cost of digital transformation	1.Give priority to grasping the market resources of China's automobile industry to avoid excessive overseas losses; 2. Although digital transformation is difficult, enterprises have the ability to innovate in technology, facilitating digital development	1.Reduce the problem of missing parts and find more suppliers;2. Review your own business and accelerate the construction of a digital innovation system

3.3. Geely Automobile

Geely Automobile has established a Digital Chemical Plant Department (2010 to date), which is responsible for the “overall planning and promotion of new manufacturing, providing internal technical services and technology promotion through the” external cooperation + independent research and development "mode, achieving the deployment of digital chemical plants in various production bases, and leading the construction of engineering technology laboratories, databases, and standardized management of databases.

In July 2017, in response to the national call to implement the “Made in China 2025” strategy, Geely Automobile cooperated with world-renowned technology companies to build a digital center and a unified and integrated data carrier. The digital center is responsible for integrating the company’s front-end and back-end, providing support for the company’s digital transformation, intelligent manufacturing, R&D, production, and organizational management. It can implement multiple applications, such as intelligent workshops, factories, production, logistics, management, and data analysis. In addition, the first full-process automotive simulation production system launched by Geely has brought innovation to the automotive industry in China [10].

4. Business Model Analysis of Digital Transformation in the Automobile Manufacturing Industry - Case of FAW Group

4.1. Product Production

FAW Group is committed to creating an efficient and accurate development framework of “real-time online, 24-hour uninterrupted, and synchronous update”, placing customer needs and customer experience at the core. Using system engineering, combining digital fusion and twin technologies, FAW Group creates an open innovation platform of “zero waiting”, organically integrating knowledge, resources, products, workforce, and data.

FAW Group cooperates in research and development, software management, comprehensive simulation, and vehicle cloud integration to rapidly and efficiently promote the construction of digital platforms. Realize “zero waiting” collaborative research and development through online data, resources, and management, promote big data and AI applications, and achieve new energy, intelligent networked vehicle health management. Build a software lifecycle management platform to achieve model-based agile development and release of software products and comprehensively improve the user experience. Focus on autonomous system integration, integrate global advanced digital technology resources, build a FAW autonomous driving simulation business ecosystem, achieve autonomous driving virtual simulation verification, and support the commercialization of L4 and L5 autonomous

driving technology. Build a vehicle cloud-integrated platform service capability around autonomous driving, vehicle road collaboration, and user scenario-based travel.

FAW Group has established a new intelligent manufacturing system with high efficiency and flexibility through continuous improvement and innovation. The system relies on the advanced “zero intervention” model and utilizes IoT, artificial intelligence, and AI technology to improve work efficiency and product quality [11].

4.2. User Services

FAW Group is committed to providing high-quality intelligent services to meet consumers' diverse and personalized needs. It has made breakthroughs in three major areas: interaction, internet connectivity, and AI autonomous driving. To achieve the transformation of providing digital industrial products and services, a shift has been made from batch products to personalized, customized products. It has realized the transformation from traditional products to “intelligent + new energy” and to “digital products and services + travel solutions”.

FAW Group accurately grasps the current economic situation and regards it as an important strategic goal. Under the guidance of “customer-centric”, FAW Group strives to create a value-creation method based on customer needs. FAW Group has successfully connected automotive products to a network through the Internet of Things application, enabling customers to view automotive information anytime and anywhere and better meet their needs. Throughout the entire development and life cycle, the Group will use dedicated lines to connect customers and consumers and develop customized pre-sales, mid-sales, and after-sales services based on customer needs. The Group utilizes Internet technology to achieve digital development, lifecycle management, and APP development, making it easier for customers. By using advanced digital technology, we can better meet users' personal needs and quality [12].

4.3. Marketing Methods

FAW Group strives to achieve a digital marketing model that combines online and offline marketing to meet ever-changing market demands, including marketing targeted at specific customer groups, marketing oriented towards large enterprises, cross-border marketing, and various marketing models centered on end consumers. In addition, it is also promoting a digital exhibition hall that integrates online and offline sales with 4S store sales models. A complete customer data analysis and management mechanism has been established by combining orders with online marketing and traditional on-site stores.

Focusing on the entire journey and scenario of users, FAW Group deeply applies the concept of intelligent marketing, guided by "direct, direct, live, and direct innovation", to achieve a comprehensive intelligent upgrade of the Red Flag customer cloud platform, continuously strengthen the management of intelligent marketing processes, and achieve transparent and efficient advertising delivery, promoting the transformation of major marketing from traditional sales management to an intelligent research system centered on content creation.

Based on the Red Flag customer cloud, build a three-dimensional marketing cloud platform, strengthen the deep integration of business and technology, and support agile innovation in the marketing system. By establishing an automated, intelligent CRM and CEM dual platform based on internal and external big data analysis insights, we ensure the ultimate user experience throughout the journey. The business system is fully SaaS oriented, targeting business personnel and building an intelligent marketing "innovation workbench" with value operation as the core and data precipitation application throughout. Establish a thick business center in the big marketing business scenario and a robust data center in the big data era, breeding new momentum for digital marketing.

4.4. Business Process

FAW Group has transformed business process driven into data-driven [13]. Through in-depth mining, careful planning, and implementation of data value, it can serve as a driving force to promote the digital transformation of enterprises, thereby eliminating traditional process division and interdepartmental barriers, and achieving efficient operation of enterprises. Take comprehensive transformation measures to improve the company's operating conditions and promote the company's development. Firstly, it is necessary to deeply explore the company's internal potential, improve its business model, and enhance its competitiveness; Secondly, it is necessary to establish a sound company management system to ensure its operational efficiency and enhance its competitiveness. Finally, it is necessary to carefully design the company's business processes according to its development situation to achieve the best state.

Enterprises can organically integrate multiple links such as enterprise resources, manufacturing execution systems, logistics distribution, and customer service through technologies such as ERP, MES, PLC, and sensors, thereby achieving comprehensive digital integration from the value chain to customer service end-to-end cross-border integration.

4.5. Organizational Structure

FAW Group systematically implements the requirements of the integrated management system of industrialization and industrialization and adjusts the organizational structure at the strategic level. The Group led in implementing corporate structure reform to transform the enterprise from a vertical hierarchical structure to a networked, flat structure. It mainly involves three aspects. First, standardize and restructure the group's organizational structure through digital business processes to ensure streamlined institutions and clear responsibilities, rights, and interests; Second, systematize, establish committees, and reorganize various functions, business departments, resource centers, and subgroups (companies) to complete organizational management system changes; The third is aggregation, which continuously integrates R&D, procurement, and other departments. The group is responsible for achieving unified management of product development and after-sales. The Group strengthened the promotion of cost reduction and efficiency increase and vigorously reduced the management level. Reorganize IT and production technicians to form a digital project team, focusing on improving data-based operations. The organizational structure layout of FAW Group has been significantly optimized, and the integration efficiency has been significantly improved, considerably enhancing the group's organizational management effectiveness.

4.6. Talent Support

FAW Group has increased its efforts to introduce digital talents, focusing on talent matching at the decision-making, management, and executive levels. In addition to focusing on the background and experience of talent, the group also needs to consider the fit between talent and corporate culture. By adapting to the company's digital strategic vision and corporate culture, digital talent can better promote realizing corporate strategic goals.

FAW Group has established a talent cultivation mechanism. Strengthen the cultivation of professional talents such as product managers, business analysts, data scientists, data engineers, and development engineers, and build an agile, highly skilled, and systematic digital transformation talent team. Establish a digital team, a selection and employment system for the survival of the fittest, and a scientific and reasonable digital talent selection mechanism.

FAW Group explores the establishment of a new digital talent training mechanism. Increasing the cultivation of high-end composite talents in digital transformation and cultivating high-end management talents through sending large internet companies abroad and studying abroad can effectively guide digital enterprise development.

FAW Group established a school-enterprise joint training mechanism. The school-enterprise joint training mechanism selects high-quality talents from universities to provide them with platforms and resources, which can be result oriented and designated to cultivate professional skills, forming a talent pool that meets the needs of enterprise development and providing front-end talents for the time of enterprise digital transformation.

5. Conclusion

This paper studies the business model of Digital transformation of China's automobile manufacturing industry through case analysis. The main conclusions are as follows. Regarding product production, automobile manufacturing enterprises are rapidly and efficiently promoting the construction of digital platforms. We have established an intelligent manufacturing system that relies on IoT, artificial intelligence, and AI technology. Regarding user service, automobile manufacturing enterprises are committed to providing high-quality intelligent services to meet users' personal needs and quality.

Regarding marketing methods, automobile manufacturing enterprises strive to achieve a digital marketing model that combines online and offline and establishes a complete customer data analysis and management mechanism. In terms of business processes, automobile manufacturing enterprises have transformed business process driven into data-driven. Promote enterprises to realize Digital transformation through in-depth mining of data value. In terms of organizational structure, the automotive manufacturing enterprise has shifted from a vertical hierarchical structure to a networked and flat structure, restructuring IT and production technology personnel to form a digital project team. Regarding talent support, automobile manufacturing enterprises are increasing their efforts to introduce digital talents and exploring establishing a new digital talent training mechanism.

The significance of this study is that, theoretically, it has made certain contributions to the theoretical development of Digital transformation of the manufacturing industry, especially the automobile manufacturing industry. It provides practical business model suggestions for the Digital Transformation of Chinese automobile manufacturing enterprises.

There are still many things that could be improved in current research, such as the need for on-site research on enterprises and the analysis of business models only focusing on six aspects. The Digital transformation of the automobile manufacturing industry is a systematic and complex long-term project. Future research should go deeper into the enterprise and analyze many influencing factors and actual problems in the transformation process. so that Digital transformation can be implemented in automobile manufacturing enterprises.

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