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Research on the impact of Changan Automobile's digital transformation on financial performance

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Abstract. Against the backdrop of rapid advancements in modern information technology, digital transformation has emerged as a global trend. This process has experienced unprecedented acceleration, particularly under the impact of the COVID-19 pandemic. Such transformation extends beyond technological innovation, encompassing critical aspects of corporate future competitiveness as well as organizational survival and growth within intensely competitive markets. As the global economy gradually recovers from the pandemic, sustaining digital transformation poses a significant challenge for enterprises. Governments worldwide have clearly recognized this imperative and have formulated corresponding strategic plans. Since 2015, China has implemented the "National Big Data Strategy," aiming to leverage big data to drive comprehensive economic growth and empower various industries. The "14th Five-Year Plan and Long-Range Objectives Through 2035," proposed in 2020, further emphasized the importance of accelerating the integration of the digital economy with traditional industries and building internationally competitive digital industrial clusters. Notably, the 2022 Government Work Report mentioned the "digital economy" for the sixth consecutive year, and for the first time, dedicated an entire paragraph to this topic, underscoring the government's heightened focus on its significance. Evidently, with continuous policy support and active participation from all sectors of society, digital transformation is poised to become a crucial driver for enterprises to navigate the future. This study selects Changan Automobile as a case study to analyze the motivations, pathways, and financial performance impacts of digital transformation in the automotive industry. The findings aim to provide insights and references for other enterprises within the sector.

Keywords: Changan Automobile, financial performance, digital transformation

1. Introduction

With China making groundbreaking advancements in science and technology, the world is witnessing a powerful wave of digital transformation. Against this backdrop, nations and regions worldwide are actively pursuing digital and intelligent transformation to secure advantageous positions in the new round of technological competition. Cutting-edge technologies such as cloud computing, big data, and the Internet of Things (IoT) are profoundly reshaping our daily lives, revolutionizing work patterns, entertainment modes, and lifestyle habits. Particularly for the automotive manufacturing industry - a vital pillar of China's economy and a crucial driver of national economic growth - traditional automakers now face significant challenges including insufficient innovation capacity and difficulties in enhancing brand competitiveness amid increasingly fierce market competition. The critical question has become how to gain a competitive edge in this transformative era. Seizing the opportunities presented by digital transformation, enhancing product quality through technological innovation, and optimizing production processes to reshape brand competitiveness have become essential strategies [1]. Therefore, implementing digital transformation is not only a strategic choice but also a necessary condition for business survival. Changan Automobile has adapted to the trends of the times by actively seeking corporate transformation and innovation, setting a strong example in the field of digital transformation.

2. Case study of Changan Automobile

2.1. Overview of Changan Automobile

Chongqing Changan Automobile Co., Ltd. (hereinafter referred to as "Changan Automobile") was listed on the main board of the

Shenzhen Stock Exchange on June 10, 1997, under the stock code 000625. Changan Automobile's business scope covers the research and development, manufacturing, sales, and services of complete vehicles and automotive components. Through continuous investment in technological innovation and a keen understanding of market demand, Changan Automobile has successfully developed a series of self-owned brand vehicles that are highly popular among consumers [1]. Meanwhile, through joint ventures and collaborations with internationally renowned automotive brands, Changan Automobile has introduced multiple co-branded vehicles into the domestic market, significantly enriching Chinese consumers' options. As one of the representative enterprises of China's automotive industry, Changan Automobile is committed to driving innovation and internationalization within the sector. The company continuously explores and implements future-oriented development directions such as green manufacturing and intelligent production, aiming to provide global consumers with safer, more environmentally friendly, and smarter mobility solutions.

2.2. Analysis of the drivers behind Changan Automobile's digital transformation

2.2.1. Support from national policies

Since the reform and opening-up, China's automotive industry has experienced significant growth and development, closely tied to the government's policies for the automotive sector. To accelerate the development of the automotive industry, China has implemented a series of supportive policies aimed at facilitating the research, development, and manufacturing of Intelligent Connected Vehicles (ICVs), thereby promoting the digital and intelligent transformation of its automotive sector. The application of digital technologies not only enhances vehicle intelligence but also optimizes production processes for greater efficiency and customization. Moreover, the advancement of vehicle intelligence enables better integration with smart transportation systems, ultimately delivering safer and more convenient driving experiences for users.

2.2.2. Development of smart technologies

In the current landscape, the advancement and application of network technology and digitalization have made the development of new energy vehicles an inevitable trend. The traditional automotive industry faces the urgent need for transformation and upgrading. While conventional internal combustion engine technology still holds a significant position in automotive production, its dominance will gradually weaken with the continuous progress of programming and automation technologies. Conversely, the level of intelligence will become a key indicator of a smart vehicle’s competitiveness [2]. It is foreseeable that future competition in the automotive industry will center around smart vehicles. Both technological innovation and product design must reach higher levels of precision and sophistication to gain a competitive edge in the market.

2.2.3. Enhancing corporate competitiveness

Amid intensifying domestic and international market competition, Changan Automobile faces fierce challenges from technologically advanced competitors such as Tesla and BYD. This competitive pressure compels Changan Automobile to continuously improve its technological innovation and service optimization to maintain its market competitiveness. The company has consistently focused on enhancing customer satisfaction, increasing brand value, driving product innovation and technological upgrades, and improving service quality as its strategic priorities. Changan Automobile has made substantial investments in internet-based and new energy vehicles, continuously exploring the application of new technologies. By integrating internet platforms with intelligent systems, the company is steering the automotive industry toward greater intelligence and connectivity. In response to the volatile market environment, Changan Automobile has adopted a dual-focused strategy that prioritizes consolidating its domestic market presence while prudently yet proactively expanding its global footprint. The company has not only strengthened its market penetration in China through meticulous operations, but has also strategically extended its international presence by establishing comprehensive sales networks, thereby systematically enhancing its brand influence worldwide.

2.3. Analysis of Changan Automobile's digital transformation path

2.3.1. Advancing intelligent manufacturing

First, establishing automated production lines. Changan Automobile has extensively deployed industrial robots and high-precision assembly technologies across its production facilities. These advanced systems ensure both high operational efficiency and consistent product quality. The robotic assembly processes significantly reduce human errors while accelerating production rates, simultaneously alleviating physical burdens on the workforce.

Second, enhancing quality control and maintenance systems. By implementing IoT solutions, Changan has achieved real-time equipment monitoring and predictive maintenance capabilities. Continuous condition monitoring prevents potential machinery

failures, ensuring uninterrupted production line operations. Furthermore, the intelligent quality control system automatically inspects product quality and immediately rejects defective items through automated sorting mechanisms.

Third, artificial intelligence integration. Within its smart manufacturing ecosystem, Changan employs AI technologies to optimize production processes and enhance production line flexibility. For instance, AI-driven real-time process optimization enables dynamic adjustment of manufacturing parameters, achieving both mass production efficiency and customized product configurations.

2.3.2. Establishing a digital management system

To build a streamlined process framework, Changan Automobile has developed its own top-level process architecture based on the American Productivity & Quality Center (APQC) automotive industry process classification framework and process models from other leading companies. This architecture categorizes processes into three primary types: operational processes, enabling processes, and support processes, with a focused emphasis on identifying key value-creating processes for customers. Building upon this framework, the company has further established a business-aligned indicator system that provides the foundation for effective process execution. Additionally, by implementing a comprehensive process operation mechanism encompassing information flow, organizational support, time and data management, as well as methodologies and tools, the smooth implementation of processes has been ensured. Changan Automobile has also developed its own process maturity assessment system by referencing Hammer's process maturity evaluation criteria and change progress indicators, enabling the evaluation of process capability levels and facilitating continuous improvement. In terms of big data operations, the company has built a massive operational platform encompassing more than 2,400 operational indicators and over 20,000 network data sources, forming a system with data at the scale of hundreds of millions [3]. Through the collection and analysis of this extensive data, the company gains valuable insights to support business management and strategic decision-making.

2.3.3. Establishing a new marketing model

The development of a digital marketing platform encompasses two primary components: the construction of an online sales platform and the utilization of social media and digital advertising. Changan Automobile has invested in establishing a comprehensive e-commerce platform that enables consumers to directly select vehicle models, configure options, compare prices, and complete purchases online. This platform facilitates virtual vehicle visualization, allowing users to examine exterior and interior features without physical dealership visits. Concurrently, the company leverages social media platforms including Weibo, WeChat, Douyin, and various portal websites to disseminate product information and promotional campaigns, thereby establishing more direct consumer engagement. Furthermore, through precision digital advertising strategies and data analytics-optimized ad placement, the company ensures effective targeting of the most relevant audience segments.

The enhancement of customer data analytics is implemented through two methodologies: precision marketing and product customization. For precision marketing, Changan Automobile analyzes multi-channel customer data encompassing purchase history, online behavior, and customer feedback to design personalized marketing initiatives. This data-driven approach enables more accurate prediction of consumer demand and market trends, facilitating the development of market-aligned products and services. Regarding product customization, the company utilizes comprehensive customer data to offer personalized vehicle configuration options, enabling consumers to select preferred colors, interior materials, and technological features according to individual preferences. This customization service not only elevates customer satisfaction but also strengthens brand loyalty.

2.3.4. Service innovation and strategic cooperation

In the process of order fulfillment, Changan Automobile not only focuses on the functionality and quality of its products but also places particular emphasis on personalized and detailed service. As a result, the company has introduced several innovative services, using technological advancements to enhance customer satisfaction and loyalty. This initiative incorporates advanced 5G-enabled remote online services that facilitate direct customer communication and real-time response to inquiries and demands, enabling staff to provide immediate assistance through either online consultation or remote support. Furthermore, Changan Automobile has launched the “Companion Partner Program,” which aims to deliver more efficient and transparent services through continuous optimization of internal interaction and management processes.

Regarding the development of an intelligent mobility ecosystem, Changan Automobile has partnered with China FAW Group and Dongfeng Motor Corporation to launch the T3 Mobility platform. In terms of ecosystem construction, Changan has established deep collaborations with Baidu, Alibaba, and Tencent [4]. Additionally, Changan Automobile has collaborated with NIO to promote the establishment of a battery swapping system, aiming to develop an efficient battery management mechanism and foster a mutually beneficial ecosystem characterized by resource sharing and co-creation, thereby driving the high-quality development of the new energy vehicle industry. Furthermore, Changan Automobile has partnered with Huawei Technologies Co., Ltd. to jointly advance the development of intelligent connected vehicles, with Huawei providing advanced information and communication technologies in this collaboration to enhance the intelligent capabilities of Changan's vehicles.

3. Financial performance analysis of Changan Automobile's digital transformation

3.1. Profitability analysis

As shown in Table 1, during the initial phase of digital transformation implementation beginning in 2018, Changan Automobile's return on total assets did not experience immediate growth; instead, it reached its lowest point in 2019. This was because the company increased its investments and allocated substantial funds to R&D during this period. Under the dual impact of increased total assets and total liabilities, the sharp rise in assets did not immediately translate into a corresponding increase in profits. Moreover, since the digital infrastructure was still under construction and incomplete at the time, the asset turnover rate declined, leading to a continuous drop in Return On Equity (ROE). However, the situation improved significantly in 2020. With the accelerated progress of digital transformation, operating income increased, and the company's profitability steadily improved. The ROE achieved a remarkable year-on-year increase of 221% and maintained a level of 6.53% in 2021, followed by a significant rise in 2022. It is noteworthy that corporate performance does not improve immediately after the implementation of digital transformation, but rather achieves significant results only after a period of information technology infrastructure development and upon formally entering the digital transformation phase. Therefore, Changan Automobile's profitability enhancement through digital transformation is positive, with this outcome being contingent upon asset accumulation and requiring temporal maturation.

Table 1. Changan Automobile's profitability indicators (2018–2023)

	2018	2019	2020	2021	2022	2023
Return on Equity	0.0145	-0.0586	0.0713	0.0653	0.1307	0.1381
Return on Total Assets	0.0072	-0.0277	0.0301	0.0284	0.055	0.0577

Data Source: Corporate Annual Reports

3.2. Solvency analysis

The current ratio and quick ratio serve as critical indicators for assessing a company's short-term solvency, reflecting its capacity to meet debt obligations upon maturity. As shown in Table 2, after the implementation of digital transformation in 2018, Changan Automobile increased its investments and R&D spending while reducing current assets. This resulted in the current ratio and quick ratio dropping to their lowest levels in recent years. However, as the company's business scale expanded and sales volume increased, these ratios gradually recovered, indicating that Changan Automobile's short-term solvency improved following the digital transformation. Compared to the initial phase of digital transformation, the significant improvement in solvency only emerged after the transformation had progressed further. This suggests that the initial investments did not generate immediate returns, highlighting the time lag in the financial impact of digital transformation. The asset-liability ratio serves as a crucial indicator for evaluating a company's long-term solvency, reflecting the degree of protection provided by corporate assets to stakeholders' equity.

As evidenced in Table 2, since implementing digital transformation, the enterprise has significantly invested in R&D for new energy projects while continuously expanding its operational scale. Consequently, the asset-liability ratio has demonstrated an overall upward trend, albeit with a relatively slow growth rate. since the launch of digital transformation, the company has invested heavily in R&D for new energy projects and continuously expanded its business scale. As a result, the asset-liability ratio showed a general upward trend, though the growth rate remained moderate. From 2018 to 2023, Changan Automobile's asset-liability ratio remained below 60%, indicating that the company maintained a relatively stable long-term solvency and a balanced relationship between assets and liabilities. This confirms that the digital transformation has positively impacted the company's solvency.

Table 2. Changan Automobile's solvency indicators (2018–2023)

	2018	2019	2020	2021	2022	2023
Current Ratio	1	1.01	1.16	1.26	1.36	1.37
Quick Ratio	0.89	0.94	1.07	1.17	1.28	1.26
Debt-to-Asset Ratio	0.5063	0.5499	0.5577	0.5874	0.569	0.5973

Data Source: Corporate Annual Reports

3.3. Operating capability analysis

The total asset turnover ratio reflects the circulation efficiency of a company's entire asset portfolio from input to output, serving as an indicator of management proficiency and utilization effectiveness concerning all corporate assets. A higher total asset turnover ratio signifies greater operational efficiency in the company's business activities. As shown in Table 3, during the period

from 2018 to 2023, coinciding with Changan Automobile's digital transformation initiative, its total asset turnover ratio exhibited consistent growth, surpassing 80% by 2022. This upward trajectory demonstrates that as digital transformation progressed, Changan Automobile achieved significant improvements in asset utilization efficiency and management capabilities, thereby driving the sustained increase in total asset turnover ratio.

The accounts receivable turnover ratio measures the speed at which a company collects its outstanding receivables. Following the commencement of digital transformation in 2018, Changan Automobile's accounts receivable turnover ratio steadily improved, indicating enhanced capital utilization efficiency, accelerated collection of receivables, and reduced bad debt losses. This evidence suggests that digital transformation can optimize corporate capital efficiency and asset liquidity.

The inventory turnover ratio reflects the speed of inventory circulation, representing both inventory liquidity and the rationality of capital allocation for inventory, thereby enabling companies to maintain sustainable operations while optimizing capital utilization. Table 3 reveals that since implementing digital transformation in 2018, the company's inventory turnover ratio increased annually, peaking at 16.56 in 2022. Although a decline occurred in 2023, the ratio remained above industry averages. This performance stems from strategic initiatives such as brand enhancement and sales channel expansion, which boosted revenue and improved inventory liquidity. Collectively, the integration of digital technologies accelerated Changan Automobile's inventory turnover, enhanced capital efficiency, and ultimately strengthened its operational capabilities.

Table 3. Changan Automobile's operating capability indicators (2018–2023)

	2018	2019	2020	2021	2022	2023
Total Asset Turnover	0.66	0.74	0.77	0.83	0.86	0.80
Accounts Receivable Turnover	41.22	62.81	56.76	55.10	51.12	55.22
Inventory Turnover	11.51	17.84	12.14	12.79	16.56	9.17

Data Source: Corporate Annual Reports

3.4. Growth capability analysis

Revenue Growth Rate represents the ratio of current-year revenue increment to prior-year total revenue. Specifically, this metric reflects the expansion or contraction of corporate operating income and serves as a vital indicator for assessing enterprise development capacity. Table 4 demonstrates that during 2018-2023, Changan Automobile consistently achieved higher revenue growth rates, signifying that its digital transformation facilitated strategic restructuring and accelerated revenue expansion. Notably, despite pandemic disruptions, the company maintained robust revenue growth, further evidencing substantial enhancement in its developmental capabilities.

Net Profit Growth Rate constitutes a crucial metric for evaluating corporate economic performance. Elevated net profit growth indicates superior operational efficiency, which fosters long-term corporate development, whereas declining profitability adversely affects business sustainability. A positive growth rate confirms profit expansion, with magnitude directly correlating to growth velocity and developmental potential. As Table 4 illustrates, Changan Automobile's net profit growth rate reached its cyclical trough in 2019. However, strategic product mix optimization—prioritizing higher-margin models—significantly restored profitability. During 2020-2023, the introduction of enhanced product lines and remarkable sales growth in new energy vehicles drove a substantial rebound in net profit growth, conclusively demonstrating the company's strengthened developmental capacity over this period.

Table 4. Changan Automobile's growth capability indicators (2018–2023)

	2018	2019	2020	2021	2022	2023
Revenue Growth Rate	-0.1714	0.0648	0.1979	0.2433	0.1532	0.2475
Net Profit Growth Rate	-0.9046	-4.8881	2.256	0.0687	1.1952	0.2269

Data Source: Corporate Annual Reports

4. Conclusion

The 20th National Congress of the Communist Party of China reiterated the imperative to accelerate the development of the digital economy and construct a Digital China, explicitly identifying the next five years as a critical period for initiating the comprehensive construction of a modern socialist country. These mandates heightened requirements for advancing digital technology innovation, deepening digital transformation, and building a Digital China. As a major manufacturing nation, China's automotive industry represents a pivotal sector within the manufacturing domain. Promoting digital transformation in the automotive industry is crucial for enhancing the core competitiveness of Chinese automotive enterprises.

This study examines Changan Automobile's digital transformation as a case study, identifying that its implementation stems from three driving factors: policy mandates, technological advancement, and internal development needs. Accordingly, Changan

Automobile has pursued digital transformation through four strategic pathways: developing intelligent manufacturing, establishing digital management systems, constructing innovative marketing models, and implementing service innovation and strategic partnerships. Analysis of key financial indicators reveals that digital transformation has generated positive impacts across multiple dimensions—profitability, solvency, operational efficiency, and growth capacity—leading to significant improvement in the company's financial performance.

This research has certain limitations. The analysis is confined to longitudinal comparisons of Changan Automobile's internal metrics without cross-sectional benchmarking against industry peers. Furthermore, enterprises should tailor digital transformation strategies to their specific circumstances rather than indiscriminately replicating others' approaches. While focused solely on Changan Automobile, this study aims to provide valuable reference insights for relevant enterprises.

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