



# An Exploration of Automotive Industry Digital Transformation Strategies: The Case Study of BMW

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**Abstract.** This paper analyzes BMW's digital transformation strategy due to intense competition and disruptive technologies in the automotive sector. The study emphasizes the need to adopt technologies like AI, big data, and business models based on platforms to stay ahead of the competition. It presents BMW's SWOT analysis, revealing its strengths, including its powerful brand and sustainability focus, but also its weakness of failing to quickly adopt emerging technologies and switch to electric power from fuels. Market trends demonstrating growing customer needs for customized and intelligent automobiles, as well as the growing significance of human-machine interfaces and intelligent systems, are also examined. Adopting the case study method, the paper evaluates BMW's existing strategies and recommends enhancements. It reveals that BMW needs to spend more on AI-based design, data-centered service optimization, and collaborations with tech companies to catch up with innovative companies like BYD. It also identifies the risks of digital disruption, including high costs and organizational change requirements, but asserts that opportunities like emerging business ecosystems and enhanced engagement of customers far outweigh these risks. Therefore, an integrated, carefully thought-out digital strategy can enable traditional companies like BMW to transform successfully, consolidate their market leadership, and develop new value in the fast-changing automotive ecosystem.

**Keywords:** Digital Transformation, Digital Strategy, Artificial Intelligence, Infotainment System, Ecosystem.

## 1 Introduction

In 2024, the global sales of cars created by BMW Group were 2450804, which decreased by 4%. At the same time, the sales of all-electric cars increased by 13.5% [1]. In China market, the BMW group is facing new competitors and the technology treat they brought to the traditional car industry [2]. The trend indicates that new technology, including AI, big data, and platform business, is reshaping the car market by revolutionizing the business model and supporting services. Under this large digital disruption, traditional industry is undergoing an unprecedented industrial revolution. In order to defend themselves from digital disruption, companies centered their core business on traditional industry need to reconstruct business models and create new value and optimize processes of service support, which is usually achieved by a certain strategy

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to update business models and technology application [3,4]. New technology has been applied in many business industries like manufacturing, which is also the front line of digital technology adoption. The technology, such as AI and big data management, is also proven to be worthy in the manufacturing industry [5]. However, there is still a vacancy in comprehensive digital transformation strategies in the car manufacturing industry. For the traditional industry companies like BMW, they have been under a strong strike since the occurrences of new technologies in the car industry, with new competitors like BYD, which centered their core business on the basis of technology innovation in China market, which accounts for around 30% of BMW's 2024 full year global sales [6]. Thus, companies like BMW are in need of a mature and comprehensive strategy for their own digital transformation to compete and stabilize their position in new business ecosystems. Bechchar et al. mentioned the key elements and steps of digital transformation for the car manufacturing industry, including data management, manufacturing execution, the application of new technologies like AI in HMI and other aspects, and the use of RFID [6]. And Trovao emphasizes the importance of the internet and information security in the process of digital transformation [7]. Others also examined the significance of the collaboration across the value chain and partnerships with technology providers [8]. On the basis of the previous study, this paper intends to examine the previous study and current digital strategy by analyzing the specific example of digital transformation and provides a comprehensive overall digital transformation strategy with risks and opportunities demonstration for traditional companies like BMW.

## **2 The Development Status of BMW**

### **2.1 Brief Introduction**

BMW was founded in 1927 in Germany. AS a German multinational manufacturer of luxury vehicles and motorcycles, BMW was outstanding in its engine manufacturing in the past few decades. Since its foundation, BMW has taken the automobile as its major business and has held a leading position in the automobile market.

### **2.2 SWOT Analysis of BMW**

In the current market situation, BMW can take advantage of the brand effect, which is created by providing customers with high-quality products and services, including outstanding engine quality and exclusive post-sales services, to further catch customers' attention [9]. Additionally, its commitment to sustainability, which focuses on CO2 emissions and its electric lineup, is also a positive factor in its solid sales, for the weakness lies in rapid technological changes and the complexity of the transition from a traditional fuel car to an electric car. There are also threats and opportunities coming from new competitors like BYD in the Chinese market, and the global need for new electric cars, which might be a potential increase in market shares for BMW.

### 2.3 Technology Block

According to market analysis from MarketstandMarkets, the market of Human-machine Interface (HMI) has achieved \$21.63 billion in 2023. Most of the HMIs are equipped with AI-enhanced systems [10]. This reveals that more and more new technologies have been put into use in the car industry. Not only are automotive suppliers tracking the new technology revolution, but customers' expectation demands more personalized and smart automotive infotainment. This trend has driven all automotive suppliers to innovate themselves with new technology, leaving the companies without a new business model, and employees with new technology employment might lose their advantages in the changing market. BMW now faces the challenge of technology innovation of its own HMI; the old interface is expected to be fully integrated with AI, IoT to provide customers with advanced user and driving experiences.

### 2.4 Faded Brand Effect and Disruption

In the past, there are 85% of vehicle sales came from foreign brands in China market [11]. But with the rise of new domestic industries, market shares held by domestic companies have increased in recent years. The domestic brands are gradually taking the leading position in new energy vehicles and smart HMI systems. Through offering competitive pricing and tailoring products to local consumers' preferences, especially in digital aspects and electric mobility, domestic brands have earned a significant amount of market share, which is quite a challenging threat to those luxury brands [11]. As a luxury foreign brand, BMW is no exception to the effect of this disruption, since China market has the biggest proportion of BMW's global sales.

## 3 New Technology Deployment

### 3.1 Technology Used

New technology can be used to improve customer experiences. This improvement is mainly reflected in the optimization of the function and the convenience of the HMI system by leveraging the AI technique like NLP, neural networks to achieve functions like context-based prediction, and safety enhancement. BMW can leverage the advanced technology to enhance road safety and make another unique selling point.

NLP (natural language processing) is a special branch in the AI field, which focuses on identifying the input of human language and understanding the context, sentiment, and meaning of the discourse. This branch allows computers to understand users' intentions and provides users with smarter and more efficient linguistic services [12]. And neural networks are the infrastructure model applied in the area of NLP.

### 3.2 Application of Technology

For the application on HMI systems, the technology can provide a more convenient experience for users by building an AI-aided infotainment system to help users execute the operation while driving. One of the usage scenarios is the minimization of the operation process. By simplifying the process of the operation step, the risk of a traffic accident will decrease, since it reduces the manual interactions when driving [13].

Another application strategy is a driver monitoring system. The system aims to track the driving status of the driver by monitoring the indicators like gaze direction, blink frequency, and any other eye expressions [13]. It will provide low-delay driving status detection. In the high-speed situation, road conditions will change extremely fast, which is quite dangerous for the driver to be disrupted. With special algorithms and fast processing speed, the system will be able to make predictions of dangerous behavior on the road and remind the driver to avoid the potential risk of an accident.

## 4 Ecosystem Building

In the era of platforms, people rely more on those digital platforms developed by companies, in which a number of modern services and product providers are now moving into digital platforms. This indicates a trend of integration of services in the platform. BMW is also in this situation. As an infotainment system on vehicles, customers expected to have a more functioning platform. About 40% of customers would change the brand just for a better infotainment system [14]. This indicates that the infotainment system is also an important part of a vehicle.

People nowadays tend to use the updated app from many service providers. They expect to use their app on their vehicle nowadays. BMW now faces the problem of an ecosystem block. With the old infotainment system on vehicles, customer cannot access the updated app and share their data on their vehicle. This might put BMW in a passive position in the market. However, there are two strategies toward the ecosystem according to Weiss et al.'s research [14].

The first strategy is to develop its own platform with its own app and complete ecosystem. BMW owns its platform, operational model, technology, and specialists. The advantages lie in the decision-making regarding technology updates and maintenance. For example, a BMW engineer can decide whether to add the function of battery status data checking in the infotainment system [14]. This leaves room for BMW's future deployment of other digital strategies, since BMW will have full control and compatibility with its platform.

Another strategy is integrating the BMW system into the existing platform and ecosystem. This means to join the platform as a third-party developer. For example, joining the platform built by Google to deploy a new Google map or other updated app in the BMW infotainment system to improve users' experiences. By integrating the system into the existing ecosystem, the workload for developing the function and software will be reduced, and the quality of app launching on the platform can be assured if the platform already has mature development engines and collaborative event design. And for customers, they can access all their third-party data through data synchronization on

the infotainment system in mobile or other user terminals, seamlessly, by just having a platform account. This compatibility potentially increases the value point.

#### **4.1 Network Effect**

Network effect is a crucial phenomenon in the digital economy. This effect lies in the fact that the more people use the product, the more benefit the user can get [15]. One realistic example is a platform like Meituan in China. By creating a digital platform for customers and merchants, it benefits both groups and makes a profit from it. For customers, the more merchants join this platform, the more options they can choose on the platform. And from the perspective of merchants, the more customers use this platform, the more potential customers they have, and they can make potential profit from this. This is actually how the network effect works: people benefit from the platform as the number of users' increases.

By integrating the ecosystem, BMW can leverage the network effect. To successfully leverage the network effect, BMW should focus on strategies that increase its extra network value and create a self-reinforcing cycle of value as the user base grows. The most effective way is to enhance compatibility and coordination [16]. Developing compatible services and a business model to fit the collaborators is a crucial step in making use of the network effect. When two compatible companies collaborate on one platform, they create extra value. This value boosting effect will grow with the size of the cooperation, and bring more customers and opportunities.

#### **4.2 Data Safety and Dependency**

Integrated ecosystems also have risks in data safety and dependency problems. An integrated ecosystem requires the sharing of data on a third-party platform. The platform uses an API, which is considered an access key for an outside source to access the company. If there are issues in the API function, for example, design flaws, API configuration errors, companies' data might be at risk of leakage or being attacked, which might cause huge damages to companies' operations. Thus, the company needs to check and monitor APIs for security and reliability, as they can introduce vulnerabilities into the company's system [17]. Another issue lies in the dependency of the company. Over-relying on the platform might cause a loss of dependency. After an enterprise connects to the platform, all its user behaviors, transaction records, operation data, etc. must be transmitted through the platform's API or system interface, and the actual data is stored on the platform's server. This way, most companies become the data generator; they do not own actual data information. To avoid this situation, BMW needs to use data federation, virtualization, and event-driven integration to connect diverse systems and reduce reliance on any single data source. Integration platforms, API management, and data cataloging tools help maintain consistent data flows and continuously monitor data dependencies and map critical data flows to quickly identify and address potential points of failure [18,19].

## 5 Conclusion

This paper has comprehensively examined BMW's plight in the face of rapidly booming auto industry digital disruption, not least as it suffers falling global sales and increasing competition from tech-led auto groups like BYD. The major issues uncovered are BMW's tardy adoption of cutting-edge technologies like AI, big data, and platform ecosystems, the difficulty of switching from conventional fossil-fueled vehicles to electric ones, and an antiquated infotainment system precluding seamless interfacing with contemporary apps and sharing of customer data. These issues have their roots in the company's deep-seated conventional business strategies, slower adoption of digital technologies than up-and-coming competitors, and decentralized approach to deploying technologies.

To address these challenges, the paper suggests several strategies. BMW should pursue a comprehensive digital transformation strategy that incorporates advanced AI, data-driven manufacturing, and human-machine interfaces (HMI) with enhanced functionality and safety. Emphasizing ecosystem integration, the study proposes two paths: building BMW's proprietary digital platform to maintain control over innovation and compatibility, or integrating into existing third-party ecosystems to leverage network effects and reduce development costs. Strengthening collaborations across the value chain and securing robust data security measures are also recommended to mitigate the risks of platform dependency and cyber vulnerabilities.

This study underlines the importance of digital transformation as much as a defensive reactivity to disruption as it is a proactive means to stabilize BMW's position and be innovative in the dynamic auto ecosystem. The study adds to the body of knowledge of how incumbent manufacturing firms can leverage technology to be competitive, citing the fact that innovative digital strategies can create new opportunities and support brand value. Nevertheless, this study has objective limitations: its insights are based primarily on literature review and conceptual analysis without extensive empirical testing within BMW's operations. Future research could focus on longitudinal case studies to observe the implementation outcomes of the proposed strategies and examine customer and stakeholder responses to BMW's digital evolution.

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