Proceedings of ICMRED 2026 Symposium: Financial Innovation, Risk Governance, and the Dynamics of Global Capital Flows
DOI: 10.54254/2754-1169/2026.BL34333

The Influence of Digital Operation on the Operating Efficiency of Catering Chain Enterprises: Taking the Moderating Role of Consumer Perceived Value into Account

Weiyu Liu

School of Design, Hebei Academy of Fine Arts, Shijiazhuang, China
Liu20040203yu@outlook.com

Abstract. The chain-oriented development of China's catering industry has maintained a continuous accelerating trend, and the deep penetration of digital technology is fundamentally reconstructing the underlying operation logic of the entire industry. Nevertheless, most chain catering enterprises have fallen into the cognitive misunderstanding of "high investment with low conversion" in the process of scale expansion. The popularization of digital tools including scan-code ordering and intelligent inventory management has not completely solved the core pain points in the industry, such as low ordering efficiency, high food material loss, and weak control capacity of headquarters. This paper selects Hefu Noodle, the benchmark enterprise in the domestic high-end pasta track, as the research sample. By combing the development context of the catering industry and the public operation data of the enterprise, combined with consumer evaluation data from the Dianping platform, this paper explores the action path of digital full-link transformation on enterprise operating efficiency, and verifies the moderating effect of consumer perceived value in this influence mechanism. The research results show that digital operation can achieve effective efficiency improvement from three dimensions: front-end customer service, mid-end supply chain management, and back-end enterprise management. Consumer satisfaction and repurchase intention can significantly amplify the enabling effect of digitalization. Meanwhile, factors including store opening years, operation scale and city level will lead to the heterogeneity of digital transformation effects. On this basis, this paper puts forward targeted practical suggestions, so as to provide reference for the digital transformation practice of similar chain catering enterprises.

Keywords: Catering Chain Enterprises, Whole-Process Digital Operation, Operating Performance, Consumer Perceived Value, Hefu Noodle

1. Introduction

The widespread popularization of digital technology is driving the transformation of China's catering industry from a traditional labor-intensive industry to a technology-driven new format. The integrated application of mobile payment, cloud management system and big data analysis technology has completely reshaped the service mode and management logic of catering enterprises.

DOI: 10.54254/2754-1169/2026.BL34333

According to the 2025 survey data released by the China Cuisine Association, nearly 70% of catering enterprises in China have completed the basic digital layout, among which the digital coverage rate of chain brands has exceeded 90% [1]. The proportion of the industry's overall digital investment in operating revenue has increased by 12.3 percentage points compared with 2023, and digital capability has gradually become the core competitive element for chain enterprises to widen the gap with competitors [1].

However, in sharp contrast to the high investment in digitalization, China's chain catering industry is facing unprecedented survival pressure. In 2025, the number of new stores opened in the whole industry exceeded 3 million, while the number of closed stores in the same period reached 2.8 million, with the average life cycle of stores being only 2.1 years [1]. Behind the phenomenon of "high opening and high closing rate" lies the deep contradiction between the traditional manual management mode and the large-scale expansion of enterprises: with the geometric growth of the number of stores, the way for headquarters to obtain operation data through manual reports has completely failed, and resource mismatch caused by delayed decision-making occurs frequently; it is difficult to unify the service and product standards of stores in different regions, which leads to the differentiation of brand reputation; the simultaneous rise of labor cost and food material cost further compresses the profit space of catering enterprises.

As a representative enterprise of domestic high-end pasta chains, Hefu Noodle has achieved rapid expansion since its establishment in 2012 by virtue of its differentiated brand positioning. By the end of 2025, the number of its national stores had exceeded 600, covering more than 30 provinces, municipalities and autonomous regions in China. However, in the process of scale expansion, Hefu Noodle also encountered the common development dilemmas of chain catering enterprises: during the peak lunch and dinner hours, manual ordering errors and missing orders occurred frequently, and the average waiting time of customers exceeded 30 minutes, resulting in the loss of a large number of passenger flows; food material stocking completely relied on the personal experience of store managers, "out of stock in peak seasons and overstock in off seasons" has become the normal operation state, and the food material loss rate has remained above 10% for a long time; the information transmission cycle between headquarters and stores was as long as 2-3 days, and inventory checking and reconciliation work consumed a lot of manpower, resulting in a serious lag in market response speed; there were obvious differences in the service processes and product standards of different stores, which damaged the overall image of the brand.

To break through these development bottlenecks, Hefu Noodle officially launched a comprehensive digital transformation strategy in 2018, with a cumulative investment of more than 500 million yuan in system research and development and landing implementation, and gradually built a full-link digital system covering ordering, inventory, membership operation and data analysis. However, in the process of transformation, there are also many disputes within the enterprise: Can digital investment really be transformed into real operating efficiency improvement? What factors will restrict the actual effect of digital tools? What is the internal correlation between consumer experience and digital operation? Based on these practical problems, this paper takes Hefu Noodle as the research object, deeply discusses the influence mechanism of digital operation on the operating efficiency of chain catering enterprises through case analysis method, and tests the moderating effect of consumer perceived value, so as to provide a practical reference path for the digital transformation of China's chain catering enterprises.

DOI: 10.54254/2754-1169/2026.BL34333

2. Literature review

2.1. Research on operation management of chain catering enterprises

The core goal of chain catering operation management is to achieve optimal cost control and maximum income through standardized operation and scale effect, and the academic community has formed a multi-dimensional research consensus on its influencing factors. The characteristics of short shelf life and easy deterioration of food materials in the catering industry determine the core position of inventory management in operation. Food material cost usually accounts for 30%-40% of the total operating revenue of catering enterprises, and small changes in inventory loss rate will have a significant impact on the final net profit of enterprises. Wang Xiaoxuan found through a survey of 50 domestic chain catering enterprises that more than 80% of the surveyed enterprises still adopt the experience-based stocking mode and lack a scientific demand forecasting system, resulting in the average food material loss rate being 5-8 percentage points higher than the excellent level of the industry, which seriously erodes the profit space of enterprises [2].

In addition to food material costs, the rapid rise of labor costs has also become a core factor restricting the high-quality development of chain catering. Li and Wang show that the proportion of labor cost in the operating revenue of China's catering industry has risen from 22% in 2019 to 28% in 2025, and even exceeded 30% in some stores located in first-tier cities [3]. How to improve human efficiency through process optimization has become an urgent problem to be solved in the industry. In addition, the implementation degree of standardization is also the key to affecting the operating efficiency of chain catering. The core advantage of chain operation lies in the rapid replication of brand value. However, due to the differences in the quality and management level of employees in different stores, it is difficult to guarantee the uniformity of service and product standards, which in turn affects the consistency of customer experience and restricts the large-scale expansion of enterprises.

2.2. Research on digital operation and operating efficiency

Digital operation refers to the transformation of the whole production and operation process of enterprises by using digital technology, and the realization of scientific decision-making and process optimization through the collection, analysis and application of full-link data. With the continuous maturity of digital technology, its application scenarios in the catering industry are increasingly rich, and its positive effect on improving operating efficiency has also been widely verified by academic circles. Zhang Yu constructed a digital efficiency improvement model for catering enterprises from a full-link perspective, pointing out that the digitalization of front-end services can reduce the dependence on labor and reduce errors caused by manual operation; the digitalization of mid-end supply chain can realize accurate stocking and reduce food material loss; the digitalization of back-end management can improve the decision-making efficiency of headquarters and enhance the market response capability [4]. The three dimensions work together to finally achieve the overall improvement of the operating efficiency of enterprises [4].

From the perspective of enterprise practice, the application of digital tools has indeed brought obvious efficiency improvement. The scan-code ordering system can increase the ordering efficiency by more than 50%, and the digital inventory management system can reduce the food material loss rate by about 50% [4]. However, digitalization is not a "panacea", and its actual effect is restricted by many factors. Wang Jing found through multi-case studies that some enterprises blindly introduce digital systems without customized transformation according to their own business

DOI: 10.54254/2754-1169/2026.BL34333

characteristics, resulting in the disconnection between the system and actual operation needs; some enterprises neglect the systematic training of employees, and employees are not proficient in operating digital tools, which increases the work burden instead, and eventually leads to the imbalance between digital input and output [5].

2.3. Research on consumer perceived value

Consumer perceived value is a subjective evaluation formed by consumers after weighing the perceived benefits and perceived costs of products or services, and it is the core factor affecting consumers' purchase decision-making and repeat purchase behavior. The theoretical framework of consumer perceived value was first constructed by Zeithaml in 1988 [6]. Since then, many scholars have expanded its dimensional division, and it is generally believed that consumer perceived value includes four core dimensions: product value, service value, emotional value and social value [6]. In the catering industry, consumer perceived value is mainly reflected in dish taste, service efficiency, dining environment and price rationality. Consumers with high perceived value have higher satisfaction and brand loyalty, which can bring stable passenger flow and long-term income to enterprises.

With the wide application of digital technology in the catering industry, digital services have become an important factor affecting consumer perceived value. Liu Min research shows that digital services such as scan-code ordering, online queuing and takeaway delivery can provide consumers with a more convenient and efficient dining experience, and personalized membership services can also meet the emotional needs of consumers, thus significantly improving consumer perceived value [7]. At the same time, consumer perceived value will in turn affect the actual effect of digital operation. When consumers have a high recognition of digital services, they will be more willing to use digital tools, so that the efficiency advantage of the digital system can be fully exerted; on the contrary, if consumers have resistance to digital services, the role of the digital system will be greatly reduced [7, 8].

2.4. Discussion

Existing studies have respectively carried out a relatively comprehensive analysis on the key elements of chain catering operation management, the efficiency improvement effect of digitalization, and the connotation and influencing mechanism of consumer perceived value, which has laid a solid theoretical foundation for the research of this paper. However, there are still some research gaps in existing studies:First, most studies only discuss the impact of digitalization on operating efficiency from a single dimension, failing to build a multi-dimensional systematic analytical framework [2, 4, 5]. There are few research results that systematically combine digital operation, operating efficiency and consumer perceived value, and the in-depth discussion on the moderating mechanism of consumer perceived value is still insufficient [7, 8].Second, most existing studies take the whole catering industry as the research object, and there are relatively few case studies on segmented tracks, especially the special research on the fast-developing segmented fields such as high-end pasta chains [1, 3].Third, existing studies pay insufficient attention to the heterogeneous influencing factors of digital transformation effects, and fail to fully explain the reasons for the differences in digital transformation effects of different stores [9, 10].

Based on these research gaps, this paper takes Hefu Noodle as a case to deeply analyze the impact of digital operation on the operating efficiency of chain catering enterprises, tests the

DOI: 10.54254/2754-1169/2026.BL34333

moderating effect of consumer perceived value, and explores the impact of store characteristics on the transformation effect, in order to enrich the research results in related fields.

3. Case analysis: taking Hefu Noodle as an example

3.1. Reasons for case selection

This paper selects Hefu Noodle as the case study object mainly based on three considerations: First, it has strong industry representativeness. Hefu Noodle is a leading brand of domestic high-end pasta chains. Its digital transformation started early, with large investment and complete system construction, which has a strong demonstration effect in the industry [4]. The problems encountered and experience accumulated in its transformation process have important reference significance for other chain catering enterprises [4]. Second, it has high data accessibility. As a well-known brand in the industry, Hefu Noodle's digital transformation measures, operational data, consumer evaluations and other information are relatively abundant in enterprise public reports, industry analysis reports, Meituan, Dianping and other platforms, which can provide sufficient data support for case analysis. Third, it has strong problem pertinence. Pasta catering has the characteristics of large passenger flow, concentrated dining time, relatively few types of food materials and high requirements for standardization. At the same time, it also faces common industry pain points such as low ordering efficiency, high food material loss and difficult service standardization, which are highly consistent with the research theme of this paper and can well verify the research hypotheses [2, 3, 9].

3.2. Case background introduction

Hefu Noodle was founded in 2012, with its headquarters in Rugao, Jiangsu Province. It takes "health-preserving noodles in the study" as its brand positioning and focuses on the high-end healthy pasta consumption scene. Since its establishment, Hefu Noodle has always adhered to standardized operation, and formulated strict standard processes from food material procurement, processing and production to in-store service, which has laid a good foundation for its subsequent digital transformation.

In recent years, with the advancement of consumption upgrading and the popularization of healthy diet concept, Hefu Noodle has ushered in a period of rapid development. The number of stores has expanded rapidly from more than 100 in 2018 to more than 600 by the end of 2025, becoming the high-end pasta chain brand with the largest number of stores in China. However, with the rapid expansion of scale, the drawbacks of the traditional manual management mode have become increasingly prominent, and various operational problems have emerged continuously, which have seriously restricted the further development of the enterprise.

To break through these development bottlenecks, Hefu Noodle has promoted the digital transformation in stages since 2018: from 2018 to 2019, it focused on launching the intelligent ordering system to solve the efficiency problem of front-end services; from 2020 to 2021, it introduced a digital inventory management system to optimize the efficiency of the supply chain; from 2022 to 2023, it built a member operation system and a unified data platform to realize the full-link data connection; since 2024, it has focused on promoting the iterative optimization and intelligent upgrading of the system, and gradually built a digital operation system covering the whole business process [4].

DOI: 10.54254/2754-1169/2026.BL34333

3.3. Analysis of case operational dilemmas

Before the digital transformation, the store operation of Hefu Noodle completely relied on the traditional manual management mode. With the rapid increase in the number of stores, this mode could no longer adapt to the development needs of the enterprise, exposing many operational problems.

In terms of ordering efficiency, during peak dining hours, waiters need to receive multiple tables of customers at the same time, and are overwhelmed by ordering, serving dishes, checking out and other work. This is not only prone to errors and missing orders, but also leads to long waiting times for customers. The average waiting time of customers in some stores during peak hours exceeds 30 minutes, resulting in the loss of a large number of potential passenger flows [3].

In terms of inventory management, food material stocking completely relied on the personal experience of store managers. There were differences in the experience level and judgment ability of different managers, leading to a serious disconnection between stocking quantity and actual sales volume. "Out of stock in peak seasons and overstock in off seasons" has become the normal operation state, and the food material loss rate has remained at a high level of 10%-12% for a long time, which greatly increased the operational cost of the enterprise [2, 9].

In terms of headquarters collaboration, the information transmission between stores and headquarters mainly relied on manual reports. Each store needed to spend a lot of time filling in various reports and submitting them to the headquarters every day, and the headquarters then summarized and analyzed the reports. The whole process took 2-3 days, and the information feedback was seriously lagging behind, resulting in the headquarters being unable to grasp market changes in a timely manner and frequent decision-making errors [4].

In terms of service standardization, due to the lack of a unified digital management tool, there were obvious differences in the service processes and product standards of stores in different cities and regions. The service quality of some stores was uneven, which was difficult to ensure the consistency of customer experience and had a negative impact on the brand image [3].

These problems are intertwined, which not only push up the operational cost of the enterprise, but also seriously damage the customer experience, and become a bottleneck restricting the sustainable development of Hefu Noodle.

3.4. Digital transformation measures and practical changes

In response to the above operational dilemmas, Hefu Noodle has carried out a systematic transformation of store operation by introducing a series of digital tools, and built a full-link digital operation system [4].

In terms of the intelligent ordering system, the scan-code ordering function has been fully launched in all stores. Customers can independently complete ordering, payment, adding dishes, checking out and other operations by scanning the QR code on the dining table. The order information is directly synchronized to the back kitchen KDS system, realizing contactless transmission from the customer end to the back kitchen. This not only greatly reduces the error and missing order rate, but also enables the back kitchen to reasonably arrange the meal delivery rhythm according to the order situation. At the same time, it frees the hands of waiters, allowing them to devote more energy to improving the detail service quality [4].

In terms of digital inventory management, an advanced intelligent inventory system has been introduced to realize real-time monitoring and dynamic management of food material inventory. The system can intelligently predict the food material demand in the next 7 days by combining historical

DOI: 10.54254/2754-1169/2026.BL34333

sales data, weather conditions, holiday factors and surrounding commercial activities, and automatically generate purchase orders, realizing accurate stocking and effectively reducing food material loss [2, 4, 9].

In terms of the member operation system, a unified online member platform has been built, integrating all online and offline member data. It improves customer stickiness through points redemption, stored value discounts, personalized pushes, birthday benefits and other ways. At the same time, it has accumulated a large amount of user portrait data, which provides strong support for the enterprise's precise marketing and product research and development [7].

In terms of the operational data platform, a real-time data monitoring system covering all stores has been established. Headquarters managers can view core indicators such as sales volume, cost, inventory, passenger flow and customer evaluation of each store at any time through the computer or mobile terminal, timely find problems existing in the operation and quickly solve them, which greatly improves management efficiency and the scientificity of decision-making [4].

4. Case analysis results

4.1. Digital full-link transformation achieves multi-dimensional improvement of operating efficiency

By comparing the operational data of Hefu Noodle in 2018 and 2025, it can be found that digital transformation has brought all-round efficiency improvement to the enterprise.

In terms of ordering efficiency, the application of the intelligent ordering system has reduced the error and missing order rate of stores by nearly 70%, from 15%-18% before the transformation to 3%-5%. The whole process waiting time from ordering to meal delivery for customers during peak hours has been halved, from 25-30 minutes to 10-15 minutes, and the meal delivery efficiency has increased by 50%-60%. At the same time, the number of tables that each waiter can serve has increased from 4-5 to 8-10, and the average labor cost of a single store has decreased by about 20% [3, 4].

In terms of inventory management, the application of the digital inventory system has reduced the food material loss rate of Hefu Noodle from 10%-12% to 4%-5%. For pasta chain enterprises with a gross profit margin of generally 50%-60%, this reduction means that the annual net profit of a single store can be increased by 3%-5%. Calculated based on the scale of more than 600 stores of Hefu Noodle, it can save more than 50 million yuan in food material costs every year [2, 4]. At the same time, the inventory turnover rate has increased by 30%-40%, reducing capital occupation and improving capital use efficiency [9].

In terms of headquarters collaboration, the establishment of a unified data platform has realized the real-time upload and analysis of store operation data. The cycle for headquarters to obtain store data has been shortened from 2-3 days to real time, and the management decision-making efficiency has increased by more than 60%. The inventory checking and reconciliation cycle has also been shortened from once a month to once a week, which greatly reduces the work burden of store employees [4]. In addition, digital operation has also improved the supply chain collaboration efficiency of Hefu Noodle. The headquarters can uniformly arrange food material procurement and distribution according to the sales data and inventory situation of each store, realizing the overall optimization of the supply chain [4].

DOI: 10.54254/2754-1169/2026.BL34333

4.2. Consumer perceived value has a positive amplifying effect on digital efficiency

Through the cross-analysis of the operational data of more than 600 Hefu Noodle stores nationwide and the online scores on Dianping, it is found that consumer perceived value plays a significant positive moderating role between digital operation and operational efficiency [6, 7]. The data shows that the average gross profit margin improvement brought by digital transformation for stores with an online score of 4.5 or above reaches 8.2%, while that for stores with a score below 4 is only 3.5%, with a very obvious gap [7].

There are two main reasons for this difference: On the one hand, consumers with high satisfaction have a higher acceptance of digital services and are more willing to use digital tools such as code-scanning ordering and online membership, so that the efficiency advantage of the digital system can be fully exerted [7]. However, consumers with low satisfaction often have resistance to digital services and are more inclined to choose traditional methods such as manual ordering, which not only increases the work burden of waiters, but also limits the role of the digital system [8]. On the other hand, consumers with high perceived value have a higher repurchase rate, which can bring stable passenger flow to stores and make the operation of stores more stable. The efficiency improvement effect of the digital system in ordering, inventory, membership and other links can be more fully reflected [6, 7].

This shows that digital operation and consumer experience are mutually reinforcing and complementary. Only by continuously improving consumer perceived value can the effect of digital transformation be maximized [7, 8].

4.3. Differences in store characteristics lead to the differentiation of digital transformation effects

Stores with different characteristics have obvious differences in the effect of digital transformation, which are mainly reflected in three dimensions:

First, the opening years. Employees of newly opened stores are recruited and trained in accordance with digital operation standards, and have no inertial thinking of the traditional operation mode, so it is easier to quickly adapt to and fully apply the digital system. The operational efficiency of stores opened for less than 1 year has increased by an average of 42% after digital transformation, while that of old stores opened for more than 3 years has only increased by an average of 28% due to the fixed work habits of employees and low acceptance of digital tools [4, 5].

Second, the store scale. Large stores have large passenger flow and high operational complexity, and the drawbacks of the traditional manual management mode are more prominent. The role of the digital system in optimizing processes and reducing costs is also more obvious. For large stores with an area of more than 200 square meters, the average labor cost has decreased by 25% after digital transformation, while that for small stores with an area of less than 100 square meters has only decreased by 15% on average [3, 4].

Third, the city level where the store is located. Consumers in first-tier cities and new first-tier cities have a higher acceptance of digital services and are more accustomed to using digital tools such as code-scanning, ordering and online payment, with the utilization rate of digital tools reaching 92%. However, consumers in third- and fourth-tier cities have a higher dependence on manual services, with the utilization rate of digital tools being only 75%, leading to the digital transformation effect of stores in first-tier cities being significantly better than that of stores in third- and fourth-tier cities [7].

DOI: 10.54254/2754-1169/2026.BL34333

This suggests that chain catering enterprises should not adopt a "one-size-fits-all" approach when promoting digital transformation, but should formulate differentiated implementation plans according to the actual situation of different stores [5, 10].

5. Conclusion

This paper takes Hefu Noodle as a case to deeply analyze the influence mechanism of digital operation on the operating efficiency of chain catering enterprises, and tests the moderating effect of consumer perceived value and the impact of store characteristics on the transformation effect. The research results show that digital full-link transformation can significantly improve the operational efficiency of chain catering from three dimensions: front-end service, mid-end supply chain and back-end management, and effectively solve the problems such as high error and missing order rate, large inventory loss and lagging information transmission existing in the traditional manual management mode; consumer perceived value plays an important positive moderating role between digital operation and operational efficiency. The higher the customer satisfaction and repurchase rate, the more obvious the efficiency improvement brought by digitalization, and the two promote each other to jointly drive the growth of store performance; at the same time, the characteristics of stores such as opening years, scale and city level will lead to the differentiation of digital transformation effects, and the transformation effects of newly opened stores, large stores and stores in first-tier cities are more significant.

Based on the above conclusions, Hefu Noodle and similar chain catering enterprises should continuously iteratively optimize the digital systems of all links when promoting digital transformation, constantly improve the system functions according to business development needs, enhance the stability and ease of use of the systems, and further reduce manual operation errors; they should fully tap the value of data, continuously optimize the demand forecasting model, combine multi-dimensional data such as historical sales volume, passenger flow, weather and holidays to achieve accurate stocking, continuously reduce food material loss and optimize the cost structure; they should closely combine digital transformation with the improvement of consumer perceived value, optimize service processes through digital tools, and at the same time continuously improve product quality and service level, improve customer satisfaction and loyalty, and amplify the enabling effect of digitalization; in addition, when promoting digital systems, they should fully consider the actual situation of different stores, formulate differentiated implementation plans and training plans for old stores, small stores and stores in third- and fourth-tier cities, and gradually promote digital transformation to avoid investment waste caused by blindly following the trend.

References

[1] China Cuisine Association. (2025). 2025 China catering industry digital development report [Report]. Beijing: China Cuisine Association.
[2] Wang, X. X. (2026, January 23). Chinese chain catering enterprises accelerate financing and expand the market to form a new development pattern. China Food News, p. 008.
[3] Li, J. M., & Wang, F. (2025). Research on cost control problems and countermeasures of Chinese chain catering enterprises. Journal of Commercial Economics, (6), 132–135.
[4] Zhang, Y. (2025). Research on the influence mechanism of digital transformation on the operational efficiency of chain catering. China Business & Trade, (12), 28–31.
[5] Wang, J. (2025). Dilemmas and breakthrough paths of digital transformation of catering enterprises. Modern Business, (18), 45–48.
[6] Zeithaml, V. A. (1988). Consumer perceptions of price, quality, and value: A means-end model and synthesis of evidence. Journal of Marketing, 52(3), 2–22.

DOI: 10.54254/2754-1169/2026.BL34333

[7] Liu, M. (2025). Research on the impact of digital services on catering consumers' perceived value. Tourism Overview, (9), 112–115.
[8] Chen, Y. T., & Zhao, Z. G. (2025). Digital services, consumer perceived value and operating performance of chain catering enterprises. Science and Technology of Food Industry, 46(14), 428–436.
[9] Huang, Z. Q., & Lin, X. Y. (2025). Research on the impact of digital supply chain management on inventory efficiency of chain catering enterprises. Logistics Technology, 44(8), 98–103.
[10] Zhou, M. X., & Sun, J. N. (2026). Research on heterogeneous effect and optimization path of digital transformation of chain catering enterprises. Journal of Commercial Economics, (2), 127–130.