Proceedings of the 2nd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/82/20231001

AI-based Transformation and Reflections on the Big Data Push Mechanism of Traditional Food Delivery Industry

- Taking Meituan as an Example

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Abstract: With the development of artificial intelligence technology, China's takeout industry has gradually introduced it into the technical construction of the platform, in which the big data push mechanism has become a hot topic of artificial intelligence placement. Under the social background that the catering industry is deeply hit in the epidemic period, this paper takes Meituan as an example, and argues the role of AI on the big data push mechanism in the transition period of the platform from the aspects of user novelty optimization, merchant-food interaction interest push, and, discovery consumption in the live broadcast business, as well as analyses its strengths and weaknesses from the perspective of economics and gives the construction of the basic model in view of its technological limitations. As a result of this series of explorations, this article can help to look forward to the transition and development of China's takeaway industry in the economic recovery period in the post-epidemic era.

Keywords: artificial intelligence, food delivery industry, O2O business model, big data push

1. Introduction

Since the Reform and Opening up beginning in 1978, China's economy has entered a phase of rapid development [1]. In recent years, the traditional offline retail catering industry is gradually transformed into the online platform model driven by the rise of Internet technology, with some takeaway APPs such as "Meituan" and "Ele.me" leading the prosperity of the online-to-offline (O2O) food delivery market in China. Since entering the twenty-first century, artificial intelligence has gradually gone from being envisioned to becoming a reality, and the takeaway industry has also seized this hotspot by adding AI mechanisms to its platform operations to improve work efficiency and customer satisfaction.

However, the outbreak of COVID-19 pandemic heavily hit the global food industry [2], and though China had released a series of policies to lift the embargo on the outbreak at the beginning of 2023, takeaway platforms today are facing a grim scenario of declining consumerism in the community. As a result, it is critical for the restaurant industry to adapt to the status quo. According to data from the National Bureau of Statistics, food and beverage revenues in January-February 2023 were 842.9 billion, an increase of 9.2%; in March and April, food and beverage revenues were 370.7 billion and

DOI: 10.54254/2754-1169/82/20231001

375.1 billion, respectively, showing an overall slow growth trend. In such a period of recovery, as a kind of emerging platform economy in the catering industry, these food delivery APPs should especially pay attention to combining with the hottest technology of the moment, i.e. artificial intelligence, and utilize cutting-edge big data analysis as social focus to construct a new profit model, so as to seize the competitiveness over its rivals.

As the all-time leader in the food delivery industry, the Meituan APP officially launched the Meituan Live section on the software's homepage in July this year, intended to expand its business and at the same time, attract more traffic stationed in the Meituan, which is struggling to transform from the model of traditional merchants stationed in the service to the shop as well as the demand for planned searches to a combination of traffic realization and geo-promotional mode. Though most believe that much of Meituan's transformation in the local life market is pushed by the Tiktok 's stride in expanding its takeaway business [3]. However, it is undeniable that Meituan urgently needs to broaden its traffic channels and must find a new development model in the live industry where traditional shelf e-commerce and interest e-commerce platforms dominate.

Although many scholars have conducted a lot of research on the role of AI in the operation of food delivery industry, the research on the changes and innovations before and after the transformation of AI technology in the process of transforming traditional takeaway platforms is not yet comprehensive. In this paper, we will take Meituan as an example, analyze its operation concept and basic model, and combine the different applications of AI in data push to explore the feasibility of Meituan's new business of live broadcasting and the implications for the food delivery industry.

2. Methodology

All along, the technical teams of Chinese takeaway platforms as well as various social research institutes have been renovating the big data push mechanism. With the advent of the artificial intelligence boom, the traditional operation mechanism of takeaway platforms is also facing the trend of integration with new industries such as e-commerce. In July 2023, Meituan announced the official launch of its live broadcast business, a move that can be seen as an important attempt to transition from its traditional takeaway platform to a hybrid model of waterfall streaming short-video push and expanding its traffic disk.

This paper will combine this innovation with a case study methodology to discuss the role of AI in its big data push mechanism from three aspects: user novelty optimization, merchant-food interaction interest push, and, discovery consumption in the live broadcast business, respectively. For each of these aspects, the paper provides an explanation of its existing big data push mechanisms, as well as recommendations and corresponding questions, as well as arguing for the use of AI in them.

3. Case Study

3.1. Meituan’s Basic Logic of Operation

To figure out the application of AI in big data push in the food delivery industry, the first thing to do is to analyze its platform's positioning of itself and the underlying operational logic. Meituan is a technology retail company, with the strategy of "retail plus technology" to fulfill the company's mission of "helping people eat better and live better". Meituan's core business, local commerce, has a large grassroots restaurant industry presence and a wide coverage of user groups.

Since its inception, it has adopted the "information + service" model, which adopts user feedback to update platform information, forming a stable natural flow of traffic through user requests. In 2022, it achieved 17.6% revenue growth for the Core local commerce segment, despite negative impacts from the macro environment, with operating profit increased by 56.8% on a year-over-year basis to RMB29.5 billion and operating margin improved to 18.4%, up from 13.8% in 2021 [4]. It can be seen

DOI: 10.54254/2754-1169/82/20231001

that Meituan has a wealth of experience in offline operations and high customer loyalty, with relatively perfect AI big data push mechanism, resulting in so its good trend in the post-epidemic economic recovery period.

In November 2011, the concept of O2O business model was first introduced to mainland China, and the Meituan platform is a typical business case of O2O in the Chinese market [5]. Compared to traditional business models such as B2B and B2C, the O2O model focuses more on service-oriented consumption. For the offline merchants stationed in Meituan, the platform makes them no longer subject to the limitations of the geographic location of the store', while for the users, the large number of retail merchants on the platform can produce more abundant [6]. With such operational logic, it is crucial to make more accurate big data push.

3.2. User Novelty Optimization

According to the work diary of the Meituan technical team, Meituan adopts the most mainstream Feed recommendation mechanism today. Compared to large shopping e-commerce platforms such as Alibaba and Jingdong Mall, the Meituan recommendation system has a limited amount of content to be distributed and fewer candidate merchants, which makes it easy to recommend too many reordering merchants, making it difficult to meet customers' new demands. The "Guess You Like" section on the homepage of its app can be seen as one of the responses to this problem [7], but what in dire need of updating is algorithm.

3.2.1. Ideas based on User Novelty Enhancement

Constrained by the number of candidates in the pool, we roughly define user novelty as ‘businesses that the user hasn't eaten at in a while, but that are to his or her liking’, measured in terms of accuracy, variety, unexpectedness and coverage [8]. For AI algorithms, the first task is to quantify the abstract ‘user novelty’ into a precise novelty definition. In this process, the system must collect a large amount of data through the number of users’ clicks and repurchases, which must include the four aspects of merchant-user distance, mealtime, merchant category, and geographical distribution of customers to build the interactivity model. This model can predict the user's immediate intent in the current scenario, thus capturing the individual needs of different users in different situations for relatively accurate big data push.

3.2.2. The Concept of ‘Beyond Accuracy’

The above mechanisms basically answer the questions of accuracy, diversity and coverage, but when it comes to unexpectedness, I think Meituan's big data push lacks a sense of "beyond accuracy". Suppose when you open one food delivery platform, the home page of the big data recommended merchants are all a certain type of dishes. They are indeed to your taste, but thus you also lose the fun of exploring other dishes. Therefore, accuracy is not enough. AI urgently need to increase the proportion of relevance recommendation in the algorithm, after all, the traditional sense of the accuracy index can only judge the accuracy of individual project prediction, but cannot judge the content of the entire recommended list [9]. However, what users face when they open the app is an entire list of recommendations, and in this palace-format recommendation stream, AI big data push has to take into account relevance and unexpectedness and redefine the value of user novelty measurement.

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3.3. Merchant-Food Interaction Interest Push

To be precise, this domain is made into dual-interaction perceived preferences, which in this paper is simplified for the sake of analyzing it from an economic point of view as merchant-food interaction interest push. The concern is that traditional big data push mechanisms focus only on a single user preference for a meal, but ignore dual preferences for stores and food [10]. Specifically, in the case of different users who all love the same kind of dish, some care more about the taste while others care more about the brand of the restaurant where the dish is served. As a result, how to rationally apply AI technology to big data push is where takeout platforms urgently need to be updated.

Regarding this issue, the Meituan technical team is currently using a dual augmented twin-tower model. This model builds on the common twin-tower model, which learns query and item representations from content features in handling large-scale retrieval, and also customizes the augmentation vectors for each query and item to mitigate the lack of information interaction [11].

However, no matter how to improve the takeaway recommendation mechanism, the platform is still in the definition of undertaking planned consumption, only to meet the basic needs of "people looking for goods". In order to improve efficiency, in addition to starting from the user recommendation aspect, the platform can try to change the way of thinking, that is, the use of AI to collect data from merchants, and gradually transform to the direction of "goods looking for people", that is, to meet the first step of unplanned consumption. The first step is to satisfy unplanned consumption. AI can input merchant labels based on the original Twin Towers model and use regional factors, time factors, etc. as influencing factors, so as to allocate the analytical weight of each element in the model, which is expected to achieve a two-way choice between merchants and users.

3.4. Discovery Consumption in the Live Broadcast Business

3.4.1. Meituan's Transformation into Live Broadcast

As early as December 2021, Meituan had already cooperated with Kuaishou to launch the Meituan small program within the Kuaishou APP, through which users can go directly to various Meituan merchants to buy packages and vouchers, as well as make reservations, online transactions and after-sales service, etc., opening up a complete scenario-based transaction chain. In July 2023, Meituan announced that it had launched its live broadcasting business on the homepage of its APP, which can be regarded as a major change in Meituan's efforts to expand the scope of its local life services by cashing in on video streams.

The extension of Meituan from simple search recommendations (i.e., planned consumption) to the live broadcast business is a major manifestation of its transformation into a composite "goods looking for people" economic model. Ten years of Internet development, the Internet population has almost reached saturation, but the users of the live platform is still to grow. Combined with the characteristics of Chinese netizens who watch live broadcasts or initiate live broadcasts, they are more inclined to pan-entertainment live broadcast modes, such as live broadcasts with goods, live games, singing and dancing performances, etc., and the live broadcasting business initiated by Meituan is expected to develop into the Netroots Economy brought about by the emergence of live broadcasts and short videos [12].

3.4.2. New Application Ideas for AI in Big Data Push

A new tool developed by Xiaoman Technology, a subsidiary of Ali International Station, can be used as one of the references for the AI recommendation mechanism in the Meituan Live. The product is called OKKI Leads, which is mainly used in the foreign trade industry, and its specific functions include helping to integrate publicly available customer information to generate an accurate portrait

DOI: 10.54254/2754-1169/82/20231001

of the seller. It can not only search for the corresponding customers through industry keywords, but also the company's attention to the customer's industry, main products and other information to form a demand input to the OKKI Leads, the system will automatically recommend the interested customers, and one-stop follow-up, management [13]. This is very suitable for the high mobility of the recommendation mechanism required by the Meituan Live. However, it is unavoidable that due to the time-sensitive nature of live broadcasting and the fact that Meituan, as a takeaway platform, is fundamentally different from the traditional short-video platform's Netflix marketing methods [14]. Meituan live broadcast will certainly bring great traffic, but for merchants, if the big traffic can't bring high profitability, but just a big call with fewer buyers, the introduction of Meituan's live broadcasting business will lose its significance. Therefore, the AI big data push system behind it must be improved on its basic real-time recommendation system, such as the introduction of the Lambda model, which divides the collected user data into multiple lines of processing and calculation, then conducts simultaneous analysis of trials in the real-time and offline state.

4. Result

According to the above analysis of this paper, Meituan has some achievements in user novelty and "goods find people" transformation attempts, in which the role of AI in big data push can not be ignored. Among them, the improved double-tower model used by Meituan's technical team in dealing with double interaction perception preference is especially a highlight, and it will be more accurate to add AI lines for analysis. However, it is undeniable that when Meituan entered the live broadcast business, its AI big data push mechanism still needs to be improved and revolutionized. On the one side, Meituan wants to learn from the experience of existing live platforms to increase traffic and recommendation, and on the other side, it also wants to meet the purpose of the takeaway platform to actually bring profit to merchants. Therefore, AI must take into account factors such as timeliness and locality in its data collection, analysis and calculation.

5. Conclusion

Meituan, as the leading O2O takeout catering platform in China, its series of innovations and transformations during the economic recovery period have in a sense indicated the future direction of this industry. With the number of Internet users becoming increasingly saturated, its combination with the current hot AI technology is a big trend. In terms of big data push, the addition of AI enables the takeaway industry to recover as soon as possible in the post-epidemic era, and in the face of users' cautious consumption behavior, it is able to maintain appropriate scheduling in accurate and surprise recommendations.

Meituan, as the leading O2O takeout catering platform in China, its series of innovations and transformations during the economic recovery period have in a sense indicated the future direction of this industry. With the number of Internet users becoming increasingly saturated, its combination with the current hot AI technology is a big trend. In terms of big data push, the addition of AI enables the takeaway industry to recover as soon as possible in the post-epidemic era, and in the face of users' cautious consumption behavior, it is able to maintain appropriate scheduling in accurate and surprise recommendations, showing the industry's vigorous vitality. Among them, the behavior of Meituan to carry out live broadcasting business is expected to become a new wind mouth in the industry, and it is likely to lead the industry to gradually cooperate with short video platforms in the future, and develop from the traditional ordering platform to the model of Netflix economy, resulting in the effect of "influencers' stores" and "star merchants". From this point of view, in addition to the need to change the basic business philosophy, the corresponding technology must also follow. The food delivery industry should firmly grasp the new hot spots of technological development, and utilize the

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great advantages of AI in data collection and model analysis to do a good job in the basic as well as important aspect of the big data push mechanism.

The limitation of this paper is that it mainly analyzes the role played by AI in the mechanism of big data push from the perspective of economics in three aspects, and puts forward some ideas and suggestions for new applications, while the specific computer modeling and design have not been analyzed too much. In addition, this paper only explores the mechanism of big data push, while the service of AI in platform pricing, marketing or customer service has not been studied. These issues will be left for more researchers to explore in depth.

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