

The influence of Artificial Intelligence in restaurants

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Abstract: AI is a cutting-edge technology and method based on an intelligent computer system that is generating enormous profits in today's industries. Smart restaurants are brand-new restaurants that use innovative technology to reduce human errors, simplify the automated process, and provide higher-quality products. Restaurants are expected to improve customer service quality, optimize supply chain efficiency, and maximize business profit in this manner. What are customers' thoughts on the smart restaurant? Is it possible for this new restaurant style to spread widely? This paper was conducted using a qualitative method, with in-depth interviews with six customers who have previously visited AI restaurants and one manager who works in an AI restaurant to clarify the customer's perception of smart restaurants. Most interviewed customers have a positive attitude toward AI restaurants, and the customers' main motivations for entering smart restaurants are curiosity and uniqueness. While the interviews revealed some reservations about this new restaurant style.

Keywords: AI, smart restaurant, customers' perception, curiosityIntroduction

1 Introduction

Artificial intelligence (AI) as a form of technology innovation and digital innovation applied in restaurants is becoming more and more common in China. The adoption of AI in the catering industry is becoming more and more common in the Chinese market, and the AI market is expected to be 11.9 billion dollars in 2023. In comparison, it was only 1.76 billion dollars in 2018. The restaurants as the core part of this study, the performance has greatly enhanced after AI was implemented. Particularly, the results from the findings that facial recognition payment and AI-powered self-ordering have been adopted in most AI restaurants and traditional restaurants. The critical reason for traditional restaurants not using other AI technologies is the high cost which includes the investment costs and the operating and maintenance costs. Many of the merchants could not afford it. The other reason is that AI technology is not mature enough. It could only do some programmed and automated simple tasks, for complex and flexible works still

need humans to do. The profits in the catering industry are increased by connecting the merchants of restaurants and customers efficiently, people's lives become easier and more convenient. The biggest advantage of the application of AI is the reduction of human mistakes and automated processes, which could bring higher quality to the product. In the near future, I believe AI will reshape the industry and elevate the restaurant business prospect.

AI could not act as human beings, especially feelings, express or imitate emotions, at least in the present state of this technology, AI technologies still cannot communicate like humans. However, most of the time, customers still need to talk with human waiters for some flexibility, and the sample size of AI restaurants may not be enough to prove the results. There are very few AI restaurants that were interviewed because of the limited amount of AI restaurants in China.

This research aimed to find the influence of AI technology in the catering industry in China. The method of this research is a qualitative research method with in-depth interviews. In-depth interviews are commonly used in qualitative research and are the most frequent qualitative data source in restaurant service research. Typically, this method includes a dialogue between researchers and participants, guided by a flexible interview draft and supplemented by follow-up questions, probes, and comments. This method could help to collect open-ended data; in order to explore participants' thoughts, feelings, and beliefs about using AI in restaurants. Based on our primary research, one of the popular hotpot restaurants Haidilao is using AI in their restaurant in Beijing, China.

2 LITERATURE REVIEW

2.1 Artificial Intelligence (AI)

As a major source of innovation, AI provides by machines that display aspects of human intelligence, and it is increasingly utilized in service and human resource management (Rust and Huang, 2014). For example, smart cars and drones, medical healthcare, smart home devices, robots for homes, hotels, and restaurants have automated many tasks, for example, virtual bots turning customer service into self-service (Fluss, 2017), big data AI applications used in finance and banking services to replace bank teller, customer service staff and risk control manager (Javelosa, 2017), and social robots instead of human greeters to welcome customers in customer-facing services (Choudhury, 2016). As one of the technology-based innovations, AI indicates that the fourth industrial revolution is coming and that many more human jobs will be replaced by AI. With the development of AI, we no longer fear the change of computers because AI or the capacity of the machines could make predictions by using a large number of data to act in a complicated and volatile environment (Agrawal et al., 2018). Consumers, employees, managers, and employers all constantly and simultaneously face complex decision-making problems at the heart of modern economies. Although many intelligent machines emerged after the middle of the

19th century, such as silicon-based computers, the aim is to discover any process of formal reasoning and simulation by digital machines (Ernst et al., 2018). Otherwise, Alan Turing (1950) argued that the difference between a computer and a brain is one of the degrees, not of principles. Thus, it is hard to distinguish between interacting with another human or with a digital machine.

Additionally, the development of artificial intelligence has benefited from three interrelated trends: the availability of large and unstructured databases, the explosion of computing power, and the rise in risky capital to finance innovative and technological projects (Ernst et al., 2018).

2.2 Business-to-consumer (B2C) in traditional restaurants

The catering industry contains small, independently owned, and large global types, from the prison food and beverage industry to the luxurious hotels. In a catering system, managers are responsible for their consumers feeling welcomed, the catering facilities work well for guests, and the whole system could serve efficiently and make profits well spontaneously (Powers and Barrows, 2003). Davis et al. (2018) explained that in the catering industry, managers' operation is the crucial point for successful management, making sure the real-time service can be offered in time for their guests. Besides, managers should make the profits obviously in their industry and balance the costs to fit the sales. In managers' daily duty in the catering industry, they should make plans, organize, motivate and control the system in catering. As the most complex and technical industry management, there are some constraints from external and internal. This research will only list the risks which could be replaced or reduced by AI technology. For example, from the external area, the risks can come from economic and technical. The cost of employees and waiters and insurance is a big resource to increase the costs. Traditional catering systems lack adequate data analysis programs and regular food production. From the internal part, food and beverage, staff, and control create risks from the waste of materials, pilferage, lack of employee knowledge and skills, less resiliency staff for instability guests flow, any inevitable reasons for absence, shortage training investment for new staffs, high-quality employees turnover, gains collection, data analysis for profits and cost supervision and design, updating of menu and pricing rules, and programs for data analysis for the whole business.

In China, the development of the catering chain still remains to improve. Even the city Chongqing, which is known as the City of Catering Industry and China has been working to make it the gastronomic capital of China since 1999, according to No. 3 Document of the State Council. For example, its characteristics are seen as backward technology, low industrialization, and organization. Especially it is in scarcity of standardized operation, stable catering servants, standard Chinese food, and the technology for low-temperature logistics (Chongping, 2011), which can be improved evidently by AI technology in practice. From a practitioner's perspective on the technology in the catering industry and hospitality industry,

Doran (2010) concluded that in the past three decades, added technology had brought great changes in the traditional catering industry, and it can only help to gain more efficiency, profits, and safety industry.

2.3 AI adoption in traditional restaurants

Before opening to foreign trade and investment and implementing free-market reform, China's economy was very poor and stagnant and relatively isolated from the world economy. However, after economic reforms and trade liberalization, China has become the world's fastest-growing economy, and the real annual gross domestic product (GDP) growth averaged 9.5% in 2018. Nowadays, China's economy has become a very important part of the world economy, and it is the world's largest economy if considered a purchasing power parity basis. While its real GDP growth has slowed significantly from 14.2% in 2007 to 6.6% in 2018. (Morrison, 2019). President Xi Jinping mentioned that AI is a new productivity power to increase economic productivity in his opening speech of the ninth Party Congress (Brookings, 2019). The future plan of the State Council targets for the growth of China's AI industry is to reach a "world-leading" level in some AI fields, with a core AI gross industry output exceeding RMB 400 billion (USD 60.3 billion) and AI-related industry gross output exceeding RMB 5 trillion (USD 754.0 billion) in 2025 (Ding, 2018). In general, developing AI in China is to increase economic profits; PwC research from 2017 estimated that China had the most to gain from AI technologies, forecasting a potential GDP boost of around 26% from AI (PWC, 2018). Moreover, AI also could improve China's productivity levels, it could help China enable to meet a sustainable economic growth and GDP targets (Ding, 2018).

Notably, China's catering industry is booming with positive growth trends. According to the National Bureau of Statistics, the revenue of the catering industry in 2018 received 4.27 trillion yuan (about \$628 billion USD), and there is a rise of 9.5% from the previous year, accounting for 11.2% of the China's total retail sales of consumer goods. In contrast, green catering and smart technology catering would be the popular trend in the future Chinese catering industry. In 2018, Chinese government announced that planning to open 5000 green restaurants and reduce kitchen waste and energy consumption per 10,000 yuan of revenue by 20% in 2022. However, restaurants in China are becoming matter, using smart management systems to analyze customers' preferences and paying with QR code or facial recognition (Xinhua, 2019). In addition, the most visible application of AI in the catering industry is the use of robots in restaurants in China, such as robot chefs and robot waiters. In 2018, one of the Chinese e-commerce companies, JD.com announced that planning to open 1000 smart restaurants in China by 2020, where all the food would be prepared by robots and all customers would be served by robots (Daxue, 2019). A compound annual growth rate (CAGR) is expected over 65.3% from 2019 to 2024 in the forecasting period on the AI food and beverage industry. The growth rate mainly results from the increasing customer

demands. The changes from traditional food style to fast, affordable, and convenient food style, also make the food and beverage industry change (Ajay, 2019). It is proved that AI technology could improve the restaurant experience both for customers and the employees from several aspects, such as the way for customers to order food and to be served, and the way for employees to prepare food and serve the customers (Walch, 2019).

3 METHODOLOGY

How do consumers feel about this novel and innovative restaurant eating way in China? In order to have a better understanding of the influence of AI technology in the restaurant in China, the research is implemented in two perspectives: managers in AI restaurants and traditional restaurants. After the secondary research analysis, the primary research was performed by qualitative method. The in-depth interview data was collected among two managers who work in traditional restaurants and one manager who works in AI restaurant. The interviews were conducted in the COVID pandemic period from April to May in 2020 via online phone call, and all the discussion was recorded to document.

An in-depth interview is one of the most common formats of data collection in qualitative research. Just as Oakly (1998) mentioned that qualitative interviews as a framework, the practices and standards are not only needed to be recorded but also have to be reinforced. In addition, an interview guide plays a significant role in an in-depth interview. In order to use the interview time more efficiently, the interview guide must have to be designed more systematically and comprehensively (DiCicco-Bloom and Crabtree, 2006). The main reason the author decided to use qualitative research methods for this study is that it is an unstructured, primarily exploratory design that focuses on small samples however, this method is intended to provide insight and better understanding (Malhotra, 2003). In particular, qualitative techniques is the method are sensitive enough to catch the participants' attitudes, motives, and behavior (Strauss and Corbin, 1998).

4 RESULTS

AI restaurants as a new style based on high technology are just emerging around China, which is the reason that there is not enough data about the number of AI restaurants. This research made a conclusion for a reason for traditional restaurants merchants to adopt AI in their restaurants and what can be the difference between the AI restaurants and traditional ones.

In order to easily access the analysis data, the respondents from traditional restaurants were marked as numbers T1 and T2. The respondent from AI restaurant was marked as A1. Respondent T1 has six working years' experience in restaurants and respondent T2 has operated two different traditional restaurants. Respondent A1 is the manager of an AI restaurant with a track system, and he has four years of working experience.

From respondent T1, he mentioned he would only accept the AI-based system when this technology becomes mature. He has believed that the machine can do the cutting and cleaning works better than humans do.

From the respondent T2, the reason why he could not accept AI systems is the high cost of AI systems in restaurants. For example, the whole AI-based system costs ten million yuan (CNY). He also mentioned that he would only use AI technology to make work easier and more efficient, but he will not totally replace humans with an AI-based system.

For both two respondents from traditional restaurants, they have a mutual opinion for the reason why they don't accept AI restaurants is the food quality from human chefs cannot be replaced by robot chefs. Once the taste is lost, they will lose their customers as in Chinese customers have high requirement for food heat control, which cannot be made by robot chef. Furthermore, human chefs have their own distinct advantages. For example, human chefs can communicate effectively with their customers in order to meet their specific needs.

Even these two traditional restaurants managers did not accept AI-based systems in their restaurants, and they were still gradually adopting AI technology. For example, they used AI technology in food ordering (store ordering machine or online platforms), dish delivery and payment (facial recognition and QR payment, iPad or QR code).

According to A1's experience, the cost is the core factor for merchants whether they decide to adopt AI technology or not. Since AI technology is innovative and has just appeared in the market, the application cost is still very expensive for many small traditional restaurants. Since there are 22 track AI systems with different colors in this restaurant, customers are required to choose one of the table mat colors, and they will take their dishes based on this color later. For the restaurant's overall layout, in addition to choosing a metal track and space decoration, the restaurant's designers did not use metal devices, while they decided to use round tables, curved glass barriers, blue, pink, and yellow table mats, and soft fabric sofas in order to give customers a warm and relaxing feeling. The creative light design makes the whole dining environment very fantastic and cool. Moreover, on the second floor, not only can customers watch the flight track of the whole restaurant, but they also can utilize a special children's area. There are still some human waiters, and even the chefs are human. Thus, this restaurant is not fully smart. They have only adopted some AI technologies, such as self-payment, iPad self-ordering, and AI food delivery track, but they do not use robots in this restaurant. The creative light design makes the whole dining environment very fantastic and cool. He was confident that the AI technology in a restaurant is mature enough, and that is also why he adopted it to his restaurant. By adopting the AI-based system in restaurants, the service quality has been increased by the increased speed of the dish delivery, within 17 seconds which is eleven times faster than humans do. The food delivery track system is much more efficient than

dishes being delivered by human waiters. Compared to the methods of traditional restaurants, the food delivery track system is not only faster but also creates a unique and special dining experience for customers. It exactly meets the customers' expectations that eating out is not only to satiate themselves but also to enjoy the nice environment and have a unique customer experience. Afterward, customers will be more satisfied and feel that AI restaurants are worth their cost. Besides, the food ordering system helped to decrease 60 percent of employees, which is a high cost in restaurants. Also, the customer flow was increased a lot by using an AI-based system, especially during weekends. The customer flow could be increased, and the turnover rate could be up to ten times even. Payment and dishes delivery can be easier and simpler, which simplifies a lot the staffs' working procedure. He could not see any difficulties when the service was replaced by an AI-based system.

5 CONCLUSION

AI-based technology has grown in popularity in the Chinese catering industry, bringing significant profits while also improving the service quality. While it is still in its early stages, it is expensive, and the technology is not yet mature enough. AI cannot act like humans, particularly when it comes to feelings, express or imitate emotions, and, at the moment, AI technologies cannot communicate like humans. However, catering managers anticipate that the ideal future will be a perfect combination of AI technology and human beings in restaurants, particularly Chinese food, which requires very strictly handmade skills.

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