

Exploring customer perceptions of smart 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, curiosity

1 Introduction

Just as Christopher Freeman (1987) said, "...not to innovate is to die". Freeman's words proved how innovation is important for any business, and the catering industry is no exception. AI is a type of computer science that contains ns developed methods and techniques and builds an intelligent computer system at the same time. According to an ancient Chinese proverb, "Illness enters through the mouth." Eating and drinking healthily have become important needs for customers since many diseases have occurred due to unhygienic and unsafe food in our daily life. However, AI in the food and beverage industry holds a massive opportunity to deliver better customer experiences, such as by checking food ingredients by image recognition; predicting sales cycles through historical data; understanding customers by monitoring consumers' emotions over social media networks; using natural language processing and data analytics; forecasting inventories through AI-power algorithms; improving supply chain through

logistics, predictive analytics, and also transparency and sorting for quality checks by using a sensor-based optical sorting technique that is powered by machine learning. Overall, AI is a process of making intelligent machines that work and react like humans. Thus, robot chefs and waiters have been invented to replace humans. Companies believe that robots can decrease costs in the long run by being faster, reliable, and more efficient. Besides, drones may replace human workers in the food delivery sector in China; it has already been tested by the Chinese company Ele.me.

The objective of this paper is to investigate customers' opinions on artificial intelligence (AI) as a form of technology innovation and digital innovation in the catering industry in China. In order to have a better understanding of the customers' perception of smart catering industry in China, the study used a qualitative research method with in-depth interviews in two perspectives: customers and AI restaurants. The in-depth interview was conducted with six customers who have visited AI restaurants before and one manager who works in an AI restaurant. The duration of each interview was approximately 20 to 50 minutes, and all the discussions were recorded.

2 Literature review

According to the Absolute Reports, AI in the food and beverage industry is expected to register a compound annual growth rate (CAGR) of over 65.3% from 2019 to 2024 in the forecasting period. The main reason for the growth rate of AI in the food and beverage industry is the change of customer demands. More and more customers prefer fast, affordable, and easily accessible food options, which are leading the transactions in the food and beverages industry (Ajay, 2019). AI has the potential to improve and transform the entire restaurant experience, from the way we order food to the way employees prepare food and serve customers (Mingotto, Montaguti, and Tamma, 2021). In order to meet customer demand and interact customers with brands, many restaurants have deployed automation, AI, and machine learning. For example, automatic machine facial recognition is an important application of most AI restaurants adopt it in the payment process, which allows you to pay with your face. Moreover, robots (mostly as chefs and waiters) are another essential element in AI application. Additionally, customers service is dramatically improved by using chatbots. The main tasks of the chatbot are guiding customers through menus and helping them order food without queuing (Fleming, 2019). Otherwise, AI in the food and beverage industry holds a massive opportunity to deliver a better customer experience, such as checking food ingredients by image recognition; predicting the sales cycle through historical data; understanding customers by monitoring consumers' emotions over social media networks; using natural language processing and data analytics; forecasting inventories through AI -power algorithms; improving supply chain through logistics, predictive analytics and also transparency and sorting for quality

check by using a sensor-based optical sorting technique, which is powered by machine learning (Daxue, 2019).

Restaurants' manual systems for restaurants have been replaced by a new technology-wheeled robotic system. This system consists of infrared ray (I.R.) sensors, a serving robot, and two android applications (i.e., customer and management applications). By emitting and detecting infrared radiation, I.R. sensors are used to sense the characteristics of their surroundings. However, customers will not be able to see the infrared waves (Livisha et al., 2018). The similarity between I.R. and AI is that they have the common goal of finding information, but they do so from different perspectives: representation (A.I.) and anti-representation (I.R.). In the learning aspect, machine learning can link the AI and I.R. together and improve both (Ying, 2017). Furthermore, many restaurants decide to use robots not only in front-of-house but also in back-of-house jobs. There are many types of robots; for example, robots are used in the kitchen to help prepare food and to cook. Robots are also worked in front-of-house operations, assisting humans with various tasks, such as managing reservations. Robots can also be a good way to attract customers. The other important AI application in restaurants is the smart bot, which could play the role of waiters giving some meal recommendations, taking food, and helping customers check out at the end (Huang and Rust, 2021).

Furthermore, AI-enabled bots are also very popular in restaurants. They can do a variety of things, such as manage reservations, respond to customer inquiries and help customers order. Even some international chains, such as Starbucks and Pizza Hut, are using a voice ordering an assistant to make it easier for their customers. Customers only need a few simple voice commands to order or re-order food, and they can also order food through voice-only menus without the assistance of a human waiter (Berezina, Ciftci, and Cobanoglu, 2019). Furthermore, KFC China started to use facial recognition for ordering and payment in some restaurants. In 2018, KFC had decided to adopt a "Smile to Pay" payment system in China and bring it to 300 locations around China. Yum China, which holds the rights to KFC in the country, first introduced this system in 2017 at KPRO, which is an upscale KFC restaurant in Hangzhou. This AI-powered self-ordering kiosk saw collaboration with Alipay and leveraged its Smile to Pay system, which had previously been used to authenticate transactions on the Alipay mobile payments platform. Thus, customers did not need to worry about payment safety when they wanted to use Smile to Pay. Furthermore, customers could also link their faces to their Alipay accounts through Smile to Pay's facial recognition system, which means they could place an order and pay without having to use any physical card, cash or even mobile phone (Perala, 2018). This payment method has already been applied widely in the lending industry; however, it is still at a preliminary stage when it is used in general. However, due to the impact of the coronavirus in China, almost everyone needs to wear masks when they are outside. Due to the

current situation, facial recognition payment still needs more time to become widespread in China soon.

AI algorithms could clearly tell you the ingredients in your meal based on an image, but they cannot change people's lifestyles and taste preferences. Moreover, artificial vision systems are a powerful tool to help customers with the automatic recognition of fruits and vegetables. It could recognize how many nutrients are in food and evaluate food safety and quality based on the visual information (Luca et al., 2017). However, for the human body, balanced nutrition in the diet is quite important for staying healthy. An AI nutrition recommender system could help humans to know how many varieties of food items need to be consumed every day in order to obtain the right amount of nutrients. If many people could follow such a well-balanced diet, the risk for cardiovascular disease and obesity rates would decrease (Theodoridis et al., 2019). Thus, AI can be medical support for those who are willing to change their unhealthy lifestyles, but it is hard to prevent unhealthy lifestyles for everyone and change others' food consumption habits.

3 Methodology and data collection

In-depth interviews are commonly used in qualitative research and are the most frequent qualitative data source in restaurant service research. This paper used a qualitative research method with in-depth interviews among six customers who have visited AI restaurants before and one manager who works in AI restaurant. 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 us 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. Due to the pandemic influence, the interview was conducted online for around 20 to 50 minutes, and all the discussions were recorded for data analysis. The interview data were collected from April to May in 2020. The statistics samplings data were analyzed by content analysis, which is mainly used for analyzing the content of communication during the personal interview (Ishiyama and Breuning, 2011). The interview guide for customers mainly focused on customers' attitudes, motivations, and experiences. Thereafter, the collected empirical data was analyzed by using qualitative content analysis and deductive and inductive approaches.

4 Results

The findings illustrate that AI technologies have not fully been adopted by many restaurants in China yet, but AI-based technologies applied into restaurants as innovative and novel manner increased customer satisfaction. The research showed the reason for customers' willingness to visit AI restaurants and not traditional restaurants, their preferences when they eat out, the way that customers make their decisions when they need to choose a type of restaurant, the way that

they think of AI restaurants, their opinions about the main differences between AI restaurants and traditional restaurants and their experiences and satisfaction after trying AI restaurants and the way that they think of the future trend of AI restaurants.

4.1 Experience of customers in AI restaurant

In the following, the characteristics of the interviewed customers are briefly described in order to understand the background of the interviewed persons. The information was collected by online interview; it is the first part of the interview. There sample size consists of six customers (four female and two male) who have visited AI restaurants. Four of them are 25 years old; however, one is 22 years old, and another is 26 years old. Regarding education level, four have a bachelor's degree, while two have a master's degree. In addition, two of the customers come from Shanghai, while the others come from Beijing, Tianjin, Lanzhou, and Yinchuan. Regarding their professions, three are students, while the remaining are communications workers for China Mobile, a trainer in cosmetics, and an English teacher in a middle school. Table 2 summarizes the customers' demographic information. Additionally, in order to process the data analysis, all customer interviewees were assigned a number for analysis C1, C2, C3, C4, C5, and C6.

Table 1: Respondent profile

	Age	Gender	Profession	Education level	Residence
Customer 1	25 years old	Female	Student	Masters	Yinchuan
Customer 2	25 years old	Female	Teacher	Bachelor	Beijing
Customer 3	22 years old	Female	Student	Bachelor	Tianjin
Customer 4	25 years old	Male	Communication worker	Bachelor	ShanghAI
Customer 5	26 years old	Female	TrAI ner	Bachelor	ShanghAI
Customer 6	25 years old	Male	Student	Masters	Lanzhou

Source: (Online Interview, 2020)

In general, the customers belong to the millennial age group, which means that they lived through a period of rapid change, both economically and technologically. They were attracted to AI restaurants as a novelty, as they are always curious about new things and are willing to try them. Based on data collected from interviews, one of the participants said, “when I heard AI restaurants from news, I could not resist trying it and want to know what kind of services they applied, what is the differences between AI restaurants and traditional ones after I experienced it” (C1). From the data, millennials have a strong willingness to try AI restaurants.

In this part, the author would like to know the way in which customers are familiar with AI and the degree to which they know about AI and AI restaurants. Moreover, before asking the participants AI knowledge-related questions, a general definition of AI was given by the authors. The AI m was to give a big picture of AI in case the customers were not familiar with AI or they had no idea about it. The first two questions are: are you familiar with the term Artificial Intelligence (AI), and what comes to your mind if I say AI (smart) restaurants. Regarding the collected data, most of the participants were familiar with the term of AI and knew many of its applications, such as robot chefs and waiters, smart ordering systems, the voice recognition systems for smartphones, floor cleaning robots, Hema's kitchen side dishes, intelligent vehicle navigation system (IVNS) and facial recognition payment. The participants' first impressions of AI restaurants were that they are cool, futuristic, and technological, which attracts them to try this new type of restaurant.

The findings showed that the needs of customers have slightly changed due to the high-pressure and high intensity works; it caused some psychological issues to come out in our lives. However, when restaurants adopted AI technologies, the needs of the people who did not want to communicate could be satisfied. On the other hand, we realized that people eat out not only to sanitize themselves but also to enjoy the nice environment and have a unique customer experience.

Meanwhile, the majority of participants mentioned that the speed of service delivery is a key factor that could influence their satisfaction with the restaurant. As society develops, the pace of life in many Chinese is becoming faster and faster, and most people do not have enough time to spend on waiting for food. It also can be one of the reasons that customer behavior changed. Nowadays, customers prefer the combination of a fast speed of service with high-quality food. Thus, in order to increase customer satisfaction, the managers of restaurants need to decrease the waiting time as much as they can while ensuring that the food is still very delicious. Furthermore, in the catering industry, the taste of food is always an essential factor that dictates success.

Motivation can be considered as a precondition that forces human behavior to occur. It explains the reason that customers behave in a way, the inspiration for their behavior and the causes of their purchases (Deci and Ryan, 1985; Namibisan, 2002). All the participants were asked about their motivations to determine for what reason customers decide to go to AI restaurants rather than traditional ones, the driving reasons for it, and the reason they chose to visit the AI restaurant. According to the collected data, nearly all of the participants started to visit AI restaurants in 2019; however, only one participant went to an AI restaurant in 2018. The fact that AI restaurants only appeared in 2018 in the Chinese market explains ns the reason that most of the customers visited one in 2019. Moreover, due to the limited number of AI restaurants in the Chinese catering industry, customers do not have a lot of choices, which is why the frequency of eating at AI restaurants is low. Most of the participants visited them only once every three or

four months. The majority of interviewees decided to try AI restaurants because of their creative, novel, and cool aspect that could satisfy the interviewees' curiosity and provide a unique experience. For example, one participant said,

It depends on the state of my life. If I travel somewhere, I prefer to try local food regardless of whether the restaurant is AI or traditional. I only care about whether it is local or not. However, if I want to eat something after a crazy busy workday, I will choose AI restaurants because they could save me time. I do not need to wait, and the speed of food delivery is very fast. Moreover, I will not be disturbed by anyone (C2).

All of the participants have a positive attitude towards the future development of AI restaurants; they believe that it is an irreversible social trend. Although AI technology is still in the initial stage of development (the technology is not mature enough), it will become increasingly better with development. Although the current AI restaurant market size and market share are quite low, they will dramatically increase soon. On the matter, one participant said,

AI technology as an essential tool makes our lives easier and more efficient. Thus, I believe that the number of AI restaurants will increase, and I estimate that the AI market size will grow by 15 to 20% in five years. In addition, the majority of traditional restaurants will implement AI technologies. AI restaurants have a good development prospect (C3).

However, two of the participants hope that the traditional restaurants will not be completely replaced by AI restaurants. The reasoning is mainly because machines do not have emotions and feelings. If there were only AI restaurants on the market, society would become colder and have no sentiment. Moreover, innovation always plays a core role in any business. A participant mentioned, "If AI restaurants cannot keep innovating and have creative ways to attract customers, over the next few years, they will become as bland as traditional restaurants" (C1). The innovation of AI restaurants can be unique, personalized and differentiate services and delicious and exquisite food. Additionally, according to the growing market size, the merchant has to do more market research in order to know customers' preferences and exact needs.

4.2 Experience of manager in AI restaurant

Due to the limited AI restaurant development, there was only one AI restaurant manager, Mr. Li, who was interviewed as AR1.

Advanced technology (including A.I.) could help restaurants to be unique. In particular, AI technology implementation can greatly increase the restaurants' cooking efficiency and reduce the speed of service delivery. Moreover, AI recommendation systems could provide personalized customer experiences, which other restaurants are unable to duplicate. Moreover, there are three market-based sources of sustainable competitive advantage: brand, offerings, and relationship.

When the author interviewed the manager of Spacelab Weightless, the restaurant was trying to build its brand image via a special AI track system in China and by offering effective and personalized services, new and creative food dishes, and nice and eco-friendly packaging of food. It is very important to build a strong relationship between AI restaurants and customers to gain customer loyalty and improve business profits. As Mr. Li said,

The customers came to our restaurant can be offered VIP membership I.D. and discounts, or red envelopes. The customers can deposit money to their VIP membership account and the money in the card is more valuable than the customers who are not VIP members. While for discounts and red envelope, in order to gain it, the customers must subscribe to our official account and repost one of our advertisements to their social media.

Manager in an AI restaurant can observe the customer reactions and their preference or dislike. As Mr. Li said,

We are glad that our customers are happy and satisfied with the AI technology services. some of them were suggested by those customers who visited us before to feel the innovative technology in AI restaurants. Some of them are really interested in Spacelab Weightless technology, which is an AI food delivery track system.

Technology Spacelab Weightless contains three aspects from food ordering, dished delivery and payment. According to Mr. Li's experience with AI restaurant customers, they do trust the AI technology because of the well-developed technology. And they are excited and curious because they enjoy the fast dishes delivery and efficient payment way. On the other hand, the service quality was improved a lot in AI restaurants. Finally, the customers do not look happier for a long period using AI technology as they feel there is no soul in the food, and they cannot feel warm and caring during the eating experience due to too many machines instead of human beings.

5 Discussion and conclusions

Customers nowadays prefer quick service, unforgettable experiences, and delicious food in a comfortable and creative dining environment. These findings perfectly match the findings of the literature research that customers' needs and behavior are dynamic, and businesses must pay close attention to them if they do not want to be eliminated by the market. AI restaurant is a new establishment. Curiosity and uniqueness are the primary motivators for customers who want to try it. Most customers polled have a favorable opinion of AI restaurants. While most participants cannot accept the robot chef because the machine lacks human emotions.

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