

# Artificial Intelligence (Ai) In The Food And Beverage Industry: Improves The Customer Experience

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**Abstract**— This study examine how Artificial Intelligence (AI) tools can help restaurants improve service quality and create a better customer experience. Robots, chatbots, facial recognition, voice-activated technology, sentiment analysis, and perceived usefulness have all been investigated. Questionnaires were used as the survey tool in this investigation. A total of 250 questionnaire sets were collected successfully. The findings demonstrate that all AI technologies have a favourable link with service quality, with Voice-Activated Technology having the strongest correlation.

**Keywords**—Artificial Intelligence, Customer Experience, Food and Beverage Industry, Robots, Chatbot, Facial Recognition, Voice-Activated Technology, Sentiment Analysis, Service Quality

## I. INTRODUCTION

The shorter product life cycle is due to technological progress, fierce competition, and unexpected client expectations [1]. This is a major issue, particularly in the food and beverage (F&B) industry. According to a recent study, the failure rate of food and beverage industry corporations in bringing new goods to market was between 70% and 80%, with a cost of up to \$20 billion. According to Mohammadi and Minaei, there is a growing demand for high-quality, healthful foods and beverages in 2019. As a result, the use of AI in F&B production has grown, as it has improved accuracy and quality, reduced uncertainty and waste, increased safety, and financial value, sped up manufacturing, and improved consumer experience [2].

Artificial intelligence (AI) is a set of technologies that enable robots to imitate human intellectual processes by learning, reasoning, and self-correcting to solve issues [3]. AI has recently been characterized as the ability to process large amounts of data autonomously [4]. According to a study published in 2019 by Sujata, Aniket, and Mahasingh, there are various AI technologies currently servicing people, including Robots, Voice-Activated Technology, and Facial Recognition, all of which are used to help people with their daily activities [3].

According to nibusinessinfo.co.uk, organizations without AI expertise must outsource their solutions to other technological companies due to the complexity of AI and the high maintenance costs. According to WebFX's recommended pricing list for 2020, third-party AI software such as Chatbots, analytic systems, and Voice-Activated Technology can cost \$0 to \$40000 each year, while a custom AI solution can cost \$6000 to \$300000 per solution [5]. Firms and businesses should make an informed decision to invest in the best AI solutions available. The restaurant technology market has grown tremendously [6]. Robots, Voice-Activated Technology, Facial Recognition, and other AI techniques, according to the researchers, can be used in the restaurant industry to improve service quality [3]. This study aims to classify AI techniques that can improve customer experience in the food and beverage business. This research paper will look at how AI tools may help restaurants enhance service quality and create a better customer experience.

## II. LITERATURE REVIEW

### A. Food and Beverage (F&B) Industry in Malaysia

A survey found that 80% of Americans prefer to eat out and that in the spring of 2016, 19 million individuals visited full-service restaurants and 49 million visited quick-service restaurants [5]. From 2014 to 2019, the average American household's out-of-home food expenditure climbed by roughly \$35269 [5].

Furthermore, Malaysia is home to three primary races: Malay, Chinese, and Indian, resulting in a unique cuisine culture [6]. According to the researchers, 64% of Malaysians prefer to eat at a restaurant at least once a day, 36% prefer to eat at home, and just 12.5% want to buy at least one meal from outside [6].

### B. Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM) theory was adopted in this study. TAM [7] is a well-known and widely used model by researchers to explain and forecast consumer acceptance of technology. TAM was founded by Fred Davis in 1986 [8]. According to Lule, Omwansa, and Mwololo

Waema, Theory of Reasoned Action (TRA) [9] was used to develop this TAM. Davis' TAM was designed with the goal of interpreting because people chose to use or not use a certain [10]. TAM has been proven to be a strong and powerful model for predicting user acceptability in numerous studies [8]. The two key components that can influence users' employment of information technology, according to Li, are "perceived usefulness (PU)" and "perceived ease of use (PEOU)". The degree to which a person believes that utilising a specific system will improve his or her job performance was characterised as PU. PEOU is defined as "The degree to which a person believes that utilising a certain system will be devoid of effort". According to Li, the perceived usefulness of technology is the most important factor in users' willingness to utilise it [11].

### III. RESEARCH METHODOLOGY

The quantitative research method was applied in this research report. Quantitative research is defined as the examination of the relationship between variables using statistical processes to test objective theories [12]. The cornerstone of the research design is descriptive research, which refers to the description of something or someone [13]. The target audience is the average customer who has used serving-related technology at least once in a Malaysian restaurant. A total of 250 people completed the survey, which consisted of closed-ended questions developed with Google Form and distributed on social media sites. H1, H2, H3, H4, and H5 were created to investigate the relationship between technology and the quality of service provided in attracting customers. Descriptive Analysis, Pearson Correlation Coefficient, and Multiple Linear Regressions are data analysis tools.

#### A. Conceptual Framework

The proposed conceptual framework illustrated in Fig. 1.

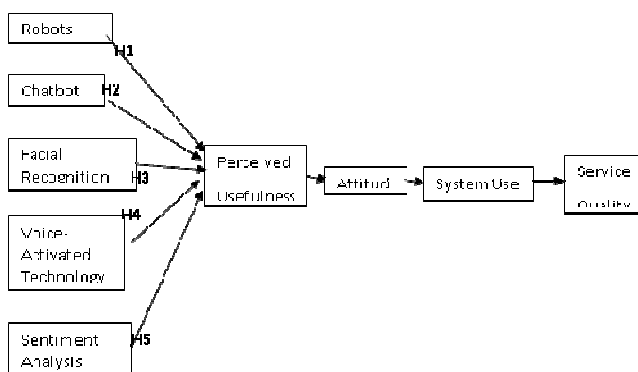


Fig. 1: Conceptual Framework

#### B. Hypotheses Development

##### 1) Service Quality

Caruana, Money, and Berthon defined service quality in 2000 as "the consequence of customers' comparisons between their expectations for a service and their perception of how the service has been provided" [14]. Service quality is an important factor in gaining a

competitive edge and long-term profitability [15]. The organizer should give good service quality which lead to high customer satisfaction and improve consumer buy intentions and sales [16]. Furthermore, poor service quality might influence a customer's purchasing intent and lower the number of potential customers [15].

##### 2) Robots and its relationship with service quality

Robot is a programmed, multifunctional device that can perform tasks in its surroundings independently or with partial control by a person, according to Berezina, Ciftci, and Cobanoglu [17]. Some robots can execute complex activities and dangerous tasks, such as rescuing people and performing surgery, in the same way as humans can. The purpose of using robots in restaurants is to differentiate a business, reach new customer segments, reduce personnel turnover, and improve service consistency. In 2020, Seyitolu & Ivanov studied the travellers who have eaten at robotic restaurants [18]. The study gathered qualitative data from 587 customers who commented on TripAdvisor about their experiences with robotic eateries [18]. Those comments were analysed using thematic content analysis. The findings indicate that while robots cannot completely replace human employees, they can help increase staff productivity and hence deliver better service. Shimmura claims that using robots in restaurants can reduce labour costs and improve service [19].

H1: There is a relationship between Robots and service quality.

##### 3) Chatbot and its relationship with service quality

A chatbot is computer software that can converse with humans in real-time chat rooms. Many organisations utilise chatbots to reduce customer service expenses and multitask [20]. The Chatbot can learn from data and answer queries like a human [17]. Restaurants can utilise chatbots to make table reservations, respond to client inquiries, offer menu item information, place orders, and manage payments, freeing up staff to focus on customer service [17]. In 2020, Chung, Ko, Joung, and Kim studied whether chatbots capable to deliver individualised care via e-service [21]. The study's findings indicate that incorporating chatbots into e-services can improve the quality of support and provide clients with unique experiences.

H2: There is a relationship between Chatbot and service quality.

##### 4) Facial recognition and its relationship with service quality

The Facial Recognition system is a biometric technology that verifies identities using pictures [22]. It may also recognise the user's attributes and provide personalised service based on their perception [23]. Kentucky Fried Chicken (KFC) in Chin use facial recognition to speed up service and allow personnel to focus on customers [24]. Additionally, airasia.com

reports that the airline is implementing facial recognition in Malaysia to expedite airport procedures by allowing clients to board planes faster by scanning at the boarding gate. According to Dang, Cooper, and Kamei (2014), utilising a facial expression recognition system in training sessions can increase the service quality of customer care representatives [25]. According to a study conducted by Munyaradzi, Prudence, and Tarirayi, the usage of facial recognition technology can help improve and customise Customer Relationship Management (CRM) [26].

H3: There is a relationship between Facial Recognition and service quality.

#### 5) Voice-Activated Technology and its relationship with service quality

According to Berezina, Ciftci, and Cobanoglu in 2019, voice-activated technology is the evolution of chatbots by shifting interaction into a conversational mode [17]. Speech recognition converts the user's voice into words, and text-to-speech converts those words into audio [27]. Voice-activated programmes are intended to free up users' hands by allowing them to initiate and complete tasks solely with their voice [17]. In 2020, according to Chang study, hotels equipped with speech-activated technology will be able to fulfil client voice requests [28]. Voice-Activated Technology in hotels, according to the study, can improve service and meet customer demand. In 2016, Kennel suggested that incorporating an analysis system into speech-activated devices enables speedy resolution of client issues during customer voice calls [29]. The study finds that the system can deliver better service by lowering contact duration and increasing problem-solving efficiency.

H4: There is a relationship between Voice-Activated Technology and service quality.

#### 6) Sentiment Analysis and its relationship with service quality

Luo et. al. defined sentiment analysis as a method that identifies and categorises subjective opinions in source materials using natural language processing, computational linguistics, and text analytics [30]. Sentiment analysis, also known as emotional analysis, classifies customers' feelings toward an entity like a service, brand, product, and so on [31]. Chang et. al. published a study in 2020 that used Sentiment Analysis to determine the customer's perceptions of hotel services [28]. The researchers analysed data from Booking.com, which included 1,492 luxury hotels in Europe with a combined client base of more than 500,000. The outcome reveals that hotels should focus on staff training, room cleanliness, and location choice to enhance customer happiness. Gitto and Mancuso discovered in 2017 that the airport prioritises passengers' requirements and perceptions of service quality [32]. The researchers employed Sentiment Analysis to assess customer reviews about airport services. The results show that several non-aviation services, such as food

and beverage and retail area services, are unsatisfactory to customers, and that the quality of services in check-in, baggage claim, and security control procedures should be enhanced in aviation services.

H5: There is a relationship between Sentiment Analysis and service quality.

## IV. RESULTS AND DISCUSSION

### A. Descriptive Analysis

The demographic profile and general information of respondents were analysed using descriptive analysis in this study. The meta data of the responders is presented in Table 1.

**Table 1** Demographic profile and general information

Demographic Profile	Categories	Frequency	Percentage (%)
Gender	Female	135	54
	Male	115	46
Age	less than 18 years old	35	14.0
	18-29 years old	178	71.2
	30-39 years old	25	10.00
	40-49 years old	11	4.4
	50 and above years old	1	0.4
Occupation	Student	170	68
	Employed for wages	53	21.2
	Self-employed	18	7.2
	Unemployed	9	3.6
Personal Income	Below RM1000	170	68
	RM1000- RM3000	42	16.8
	RM3000- RM5000	35	14
	RM5000 and above	3	1.2
Dining-out frequency	Less than once a week	61	24.4
	1-2 times a week	75	30
	3-4 times a week	72	28.8
	5-6 times a week	23	9.2
	6-7 times a week	9	3.6
	More than 7 times a week	10	4
Most frequent restaurant type	Fine Dining	13	5.2
	Casual	194	77.6
	Fast Food	43	17.2
	Other	0	0

The sample size for this study is 250. The demographic profiles of the questionnaire respondents are shown in Table 1. Female respondents make up 54% of the total number of respondents (135), while male respondents make up 46% of the total number of respondents (115). The greatest age group of respondents is 18-29 years old, with 178

respondents (71.2%), while the smallest age group is 50 and above years old, with only one responder (0.04). The largest occupation status of the respondents is students (170) and the lowest is jobless (3.6%). The respondents with incomes less than RM1000 comprise the largest group, with 170 respondents (68%). The highest range of respondents' dining out frequency is 1–2 times per week, represented by 75 respondents (30%), while the lowest range is 6–7 times per week, represented by 9 respondents (3.6%). Additionally, the most frequent restaurant type visited by respondents is casual, with 194 respondents (77.6%), and fine dining, with 13 respondents (5.2%).

### B. Pearson Correlation Analysis

Pearson Correlation Coefficient had been used to measure the relationship between independent variables (Robots, Chatbot, Facial Recognition, Voice-Activated Technology, Sentiment Analysis, Service Quality) and the independent variable (Service quality). The Pearson correlation is between 0.530 to 0.674, while the significant level for all variables is 0.000 and all the variables are positively correlated. Based on the results shown in Table 2, all the independent variables have a moderate positive correlation with service quality, which are Robot ( $r = 0.613$ ,  $p < 0.01$ ), Chatbot ( $r = 0.530$ ,  $p < 0.01$ ), Facial Recognition ( $r = 0.622$ ,  $p < 0.01$ ), Voice-Activated Technology ( $r = 0.674$ ,  $p < 0.01$ ) and Sentiment Analysis ( $r = 0.607$ ,  $p < 0.01$ ). The Voice-Activated Technology had the greatest correlation with service quality and the lowest is Chatbot. Table 2 presented the result of Pearson Correlation Analysis.

**Table 2** Pearson Correlation Analysis

		Robots	Chatbot	Facial Recognition	Voice-Activated Technology	Sentiment Analysis
Service Quality	Pearson Correlation	0.613	0.530	0.622	0.674	0.607
	P-Value	0.000	0.000	0.000	0.000	0.000
	Strength of Association	Moderate Positive Correlation	Moderate Positive Correlation	Moderate Positive Correlation	Moderate Positive Correlation	Moderate Positive Correlation

The strength of each individual independent variable to the dependent variable is compared by the standardized beta coefficient. Based on Table 3, the standardized coefficients showed the beta of Voice-Activated Technology (0.305) is the most significant factor that influencing the service quality; followed by Chatbot with beta 0.208; Robot with beta 0.195; Sentiment Analysis with beta 0.155 and Facial Recognition is the last and least important factor with beta 0.123.

**Table 3** Coefficients

	Unstandardized Coefficients	Standardized Coefficients		

Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	0.295	0.208		1.421	0.157
	Robot	0.191	0.054	0.195	3.545	0.000
	Chatbot	0.185	0.041	0.208	4.480	0.000
	Facial Recognition	0.107	0.053	0.123	2.005	0.046
	Voice-Activated Technology	0.285	0.056	0.305	5.100	0.000
	Sentiment Analysis	0.175	0.063	0.155	2.794	0.006

Table 4 presents the findings on the hypothesis testing.

**Table 4** major findings on hypothesis testing

No.	Hypothesis	Significant Level	Conclusion
H1	There is a relationship between Robots and service quality.	$\beta = 0.195$ $p = 0.000 < 0.05$	Supported
H2	There is a relationship between Chatbot and service quality.	$\beta = 0.208$ $p = 0.000 < 0.05$	Supported
H3	There is a relationship between Facial Recognition and service quality.	$\beta = 0.123$ $p = 0.046 < 0.05$	Supported
H4	There is a relationship between Voice-Activated Technology and service quality.	$\beta = 0.305$ $p = 0.000 < 0.05$	Supported
H5	There is a relationship between Sentiment Analysis and service quality.	$\beta = 0.155$ $p = 0.006 < 0.05$	Supported

#### 1) Relationship Between Robots and Service Quality

Table 4 shows the p-value of Robots ( $p = 0.000$ ) is lower than the significant level of 0.05 with a positive  $\beta$ -value of 0.195. Thus, there is a positive significant relationship between Robots and service quality.

#### 2) Relationship Between Chatbot and Service Quality

Table 4 shows the p-value of Chatbot ( $p = 0.000$ ) is lower than the significant level of 0.05 with a positive  $\beta$ -value of 0.208. Thus, there is a positive significant relationship between Chatbot and service quality.

#### 3) Relationship Between Facial Recognition and Service Quality

Table 4 shows the p-value of Facial Recognition ( $p = 0.046$ ) is lower than the significant level of 0.05 with a positive  $\beta$ -value of 0.123. Thus, there is a positive significant relationship between Facial Recognition and service quality.

#### 4) Relationship Between Voice-Activated Technology and Service Quality

Table 4 shows the p-value of Voice-Activated Technology ( $p = 0.000$ ) is lower than the significant level of 0.05 with a positive  $\beta$ -value of 0.305. Thus, there is a positive significant

relationship between Voice-Activated Technology and service quality.

### 5) Relationship Between Sentiment Analysis and Service Quality

Table 4 shows the p-value of Sentiment Analysis ( $p = 0.006$ ) is lower than the significant level of 0.05 with a positive  $\beta$ -value of 0.155. Thus, there is a positive significant relationship between Sentiment Analysis and service quality.

## V. CONCLUSION

### A. Conclusion

The project is aimed at investigating whether Artificial Intelligence tools can be used to improve service quality and thus the customer experience in the food and beverage business. The findings meet the research goals. All the independent factors have a positive association with the dependent variable, and Voice-Activate Technology is the most significant predictor in that regard. Finally, this paper discusses the study's weaknesses as well as future research recommendations. This research article could be used as a starting point for further research.

### B. Implications of the Study

According to the data, robots have a correlation with service quality, which suggests that respondents agree that robots can deliver a better service. After reviewing this research paper, the restaurant owners can determine whether or not to use Robots to serve customers. Robots can be employed in a variety of vocations, including entertainment, cooking, and food delivery. According to a study by Seyitolu and Ivanov, customers are favourable about the entertaining Robots and find them appealing [18]. Additionally, Shimmura demonstrated that robots can do the task of delivering food to consumers, allowing humans to focus on their jobs [19].

A chatbot influences the quality of service. Chatbots can interact with individuals in chat box without human intervention, reducing costs and enabling multitasking [20]. Nowadays, chatbots are incredibly popular in a wide variety of businesses, demonstrating the Chatbot's effectiveness. Restaurant businesses should consider incorporating a chatbot into their operations to reduce labour costs and errors.

According to the research, Facial Recognition has a connection with service quality, however it is the lowest factor in comparison to the other variables. Facial Recognition is the process of matching an image from a database to a user's face, and then providing personalised service based on user perception to improve customer experience [23]. Restaurant operators can utilise facial recognition to improve personnel service quality, recognise user traits, and give personalised service based on the user's impression.

A substantial correlation exists between the Voice-Activated Technology and the quality of the service. Voice-activated programmes help people release their hands by

using their voice to activate and perform activities [28]. As an example, the Voice-Activated Technology can be used to take a customer's purchase over the phone or to aid workers in solving problems by using the database. Voice-Activated Technology may be used to order meals and payment at the restaurant.

Sentiment Analysis, the final independent variable, also has a relationship with service quality. Sentiment Analysis can be used to examine client feedback and sentiment toward a firm. This AI software has seen extensive use in a variety of industries, including airports, where it is used to evaluate service based on customer feedback. Restaurant operators can implement Sentiment Analysis in their establishments to allow guests to review and identify areas for improvement.

### C. Limitations and Recommendations

The study's first flaw is the age imbalance of the respondents. Future study should aim to balance the age of respondents, collect additional data from the middle age group, and not simply disseminate questionnaires through online platforms. While distributing questionnaires via an online platform is convenient and cost-effective, some members of the age group may spend less time online or are unfamiliar with technology. Only 250 people answered the research question in this study. In comparison to a small sample size, a greater sample size can improve the accuracy and dependability of the data and results.

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